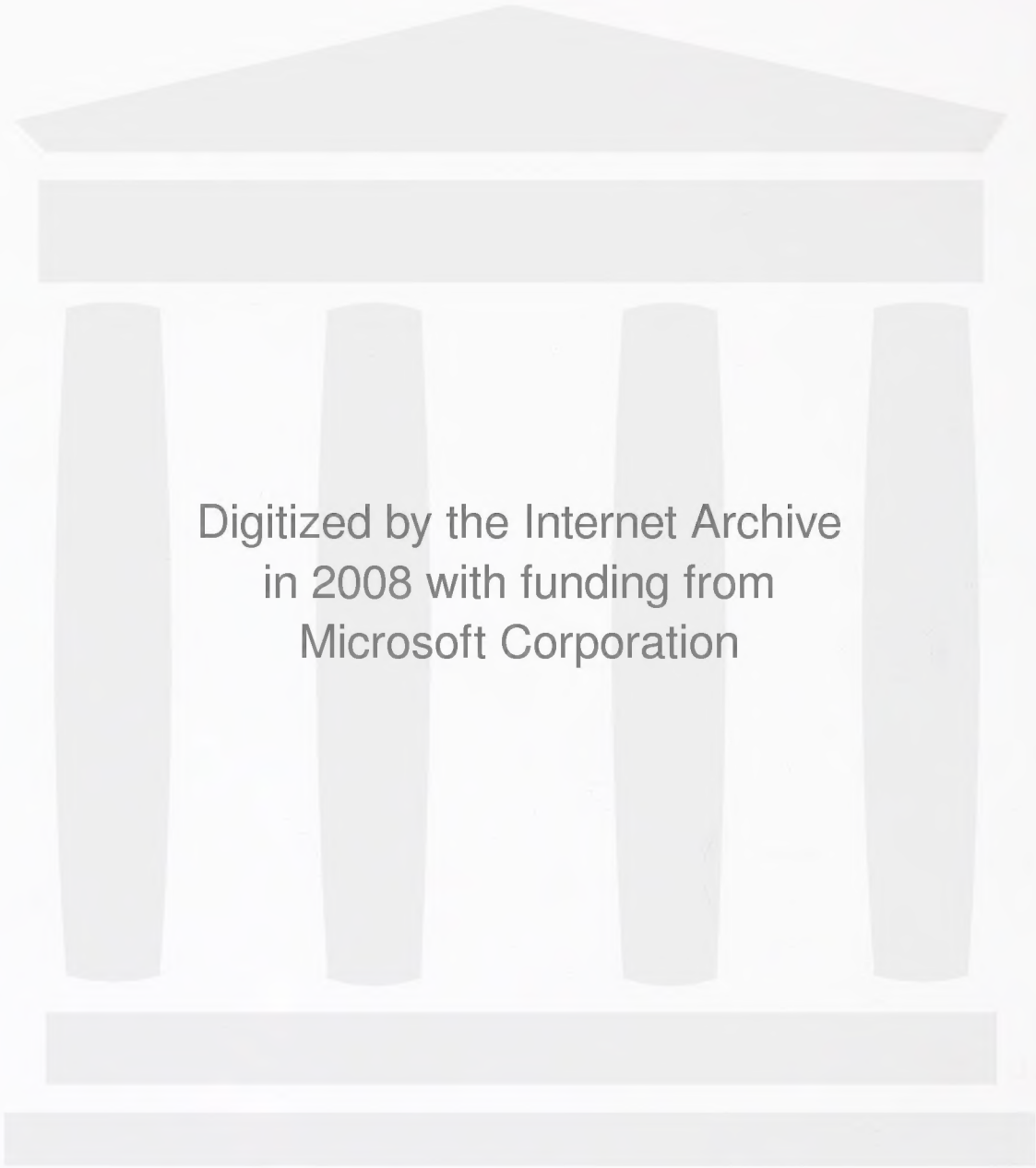


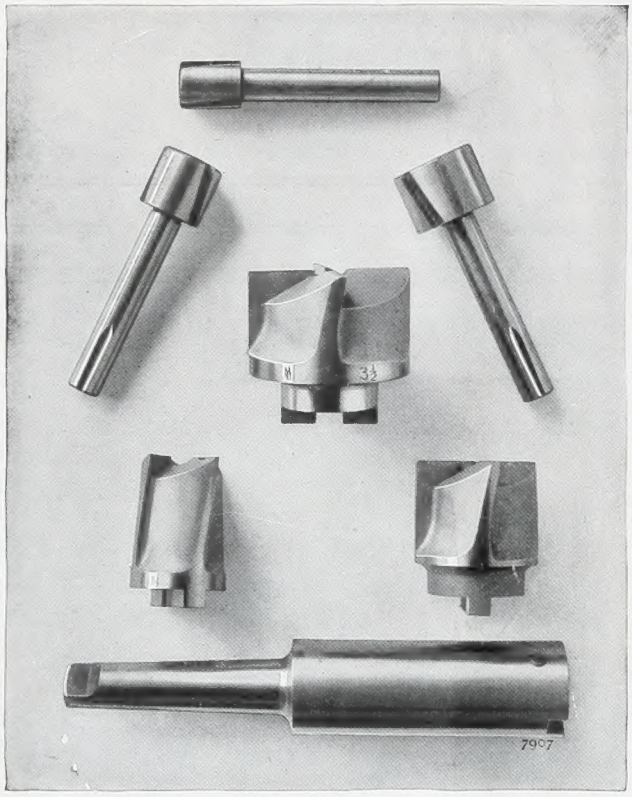
CIRCULATES IN EVERY PROVINCE IN CANADA

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by the MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XIV | Publication Office: Toronto, October 7, 1915 | No. 15

Make Your Own Combination



For every counterboring job you can make immediately the right combination of holder, cutter and guide if your tool room is equipped with

P. & W. Interchangeable Cutter Counterbores

Holders, Cutters and Guides furnished in wide range of sizes.

Holders

End of holder is milled to receive the driving lug of the cutter and there is also a hole and set screw to accommodate the shank of the guides.

Guides

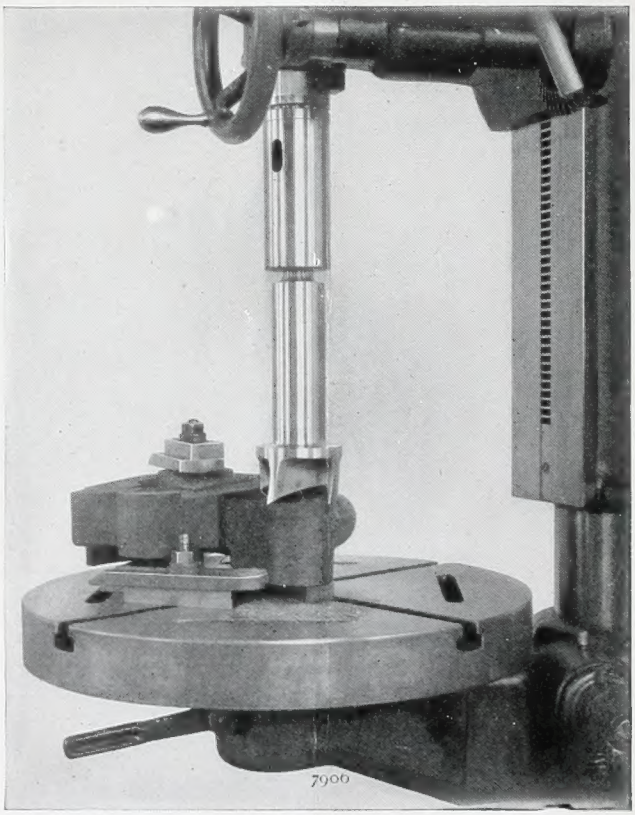
Are of hardened tool steel. They are held in place by means of a set screw in the holder engaging a V-slot in the shank of the guide.

Cutters

Can be furnished of either carbon or high speed steel.

The shank of the guide passes through the hole in the cutter and the shoulder between the guide and its shank keeps the cutter in place. Cutters can be sharpened on the face and the guide is simply pushed further in the hole after grinding.

Write for catalog "Small Tools" showing our complete line.



Spot Facing
with a P. & W. Interchangeable Cutter Counterbore

Place a trial order with our nearest store.

Pratt & Whitney Company of Canada, Limited

DUNDAS	MONTREAL	WINNIPEG	VANCOUVER
Ontario	723 Drummond Bldg.	Bank of Hamilton Bldg.	B.C. Equipment Co.

The advertiser would like to know where you saw his advertisement—tell him.

The Publisher's Page

By B.G.N.

Meeting New Conditions.

¶ When an enterprising young salesman entered a business house one day with a patented machine he was told that there were no existing conditions to warrant its adoption. The new way might be a little quicker, it might be a little easier, and perhaps as accurate, BUT—

¶ This business house saw no immediate material gain, and didn't estimate the possibilities of the new Calculator when once the trial stages of development were passed and improvements added to meet requirements.

¶ They were working on the principle, somewhat belated, that to conserve expenditure is to save money.

¶ It was this same notion about spending versus saving that horrified Li Hung Chang, the Chinese Emperor, when he visited the United States some years ago. And it was an advertising expert who reminded the gentleman from Tokio that America, by spending lavishly, had become the richest country in the world.

¶ That reminds us of another story:—

¶ Three years ago when, in our opinion, Canada's rapidly developing market demanded a better and more frequent service than a monthly journal afforded, a section of our clients said the movement was all right, **but too advanced.**

¶ To-day, if we may be permitted to say so, there is scarcely one of our readers or advertisers who would be satisfied to wait a month for their paper. The Machinery and Metal-working field has undergone a transformation and is still shifting with the rapidity of Mercury. Conditions unforeseen brought about the change in a night, so to speak.

¶ We are able, in the midst of a world crisis, to place before our readers and advertisers a concentrated adequate weekly service, born of timely experience, that would have been impossible had the paper remained a monthly.

¶ **THE NEW CONDITIONS** we speak of are affecting your plant. The editorial columns of each issue of CANADIAN MACHINERY contain some article or articles relating to current problems and methods of meeting them. It will both interest and assist you to read these articles. To read the advertising pages will aid you in buying, and the use of them yourself will profit you in selling.

¶ **A card will bring you full information.**

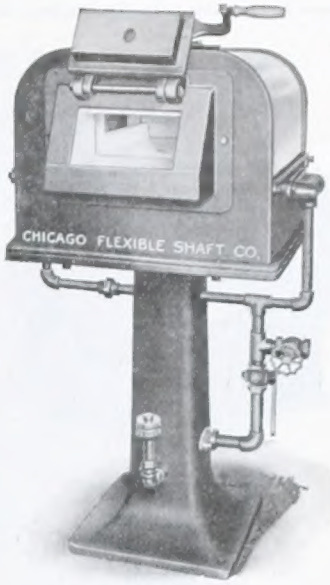
CANADIAN MACHINERY
143-153 University Ave. TORONTO

Stewart Gas and Oil Furnaces

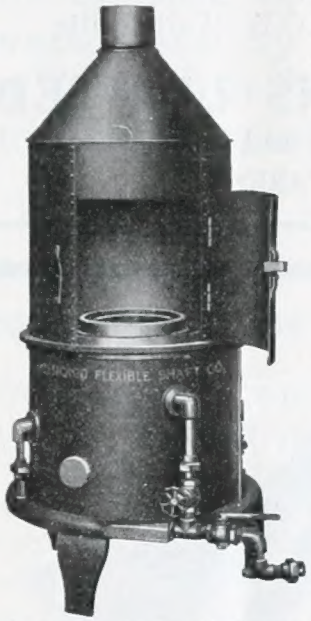
FOR THE TOOL ROOM, ETC.

To keep a plant up to its highest efficiency provision must be made for the proper hardening of its tools (high speed or carbon steel).

The Stewart No. 1 Oven has proven by most severe tests that it is equal to every occasion. The walls are 4" thick and made of a special mixture of fire clay and silica to withstand the high heats. By a Simple Control, heats may be varied from those for carbon steel to high-speed steel. The opening is 5" high by 9" wide by 13½" deep. The average gas consumption 100 cubic feet per hour. **Price with blower $100.00. Price without blower $75.00. Twenty-seven other sizes of ovens in stock.**



STEWART NO. 1 OVEN



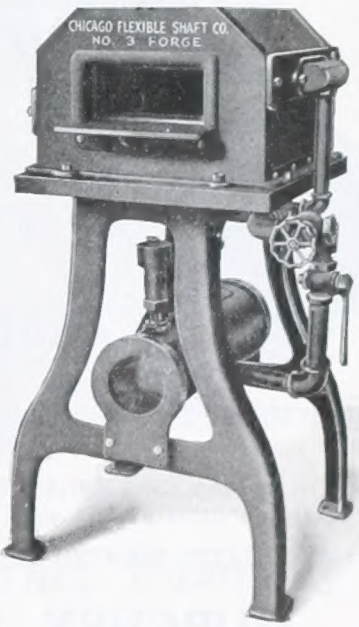
Stewart No. 10 Cyanide Furnace

The Stewart No. 10 Cyanide Furnace may be used for any sort of a bath requiring a heat under 1800° Fahr. It is fitted with a hood to carry the poisonous or offensive fumes to a flue. The pot is of pressed steel and is 8" in diameter and 10" deep, ¼" thick, allowing a quick heat. By having a number of extra pots ($4.00 each), as many different baths as desired may be used. Lead or cyanide hardening—salts bath—oil tempering, etc.

Price with blower	**$115.00**
Price without blower	**75.00**

We have 24 other stock sizes in this type.

This Stewart No. 3 Forge is most convenient in the tool room for tool dressing, forming, shaping or bending. The front opening is 3½" x 8" and gives a heat 10" long. Rear opening 3¼" diameter (same size as front if specified.)



No. 3 FORGE

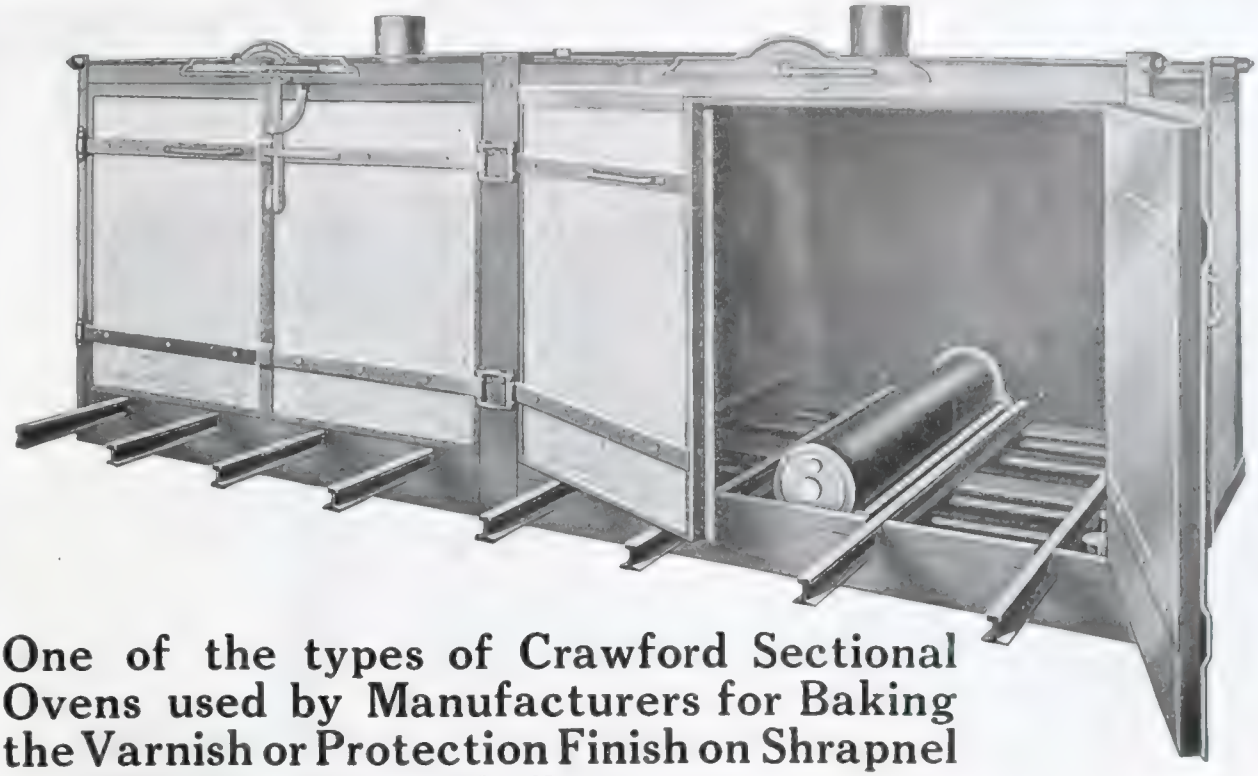
High heats (direct) may be obtained much more quickly than in an oven and may be held indefinitely. Occupies little floor space (23" x 26") and consumes about 90 cubic feet of gas per hour. This, like all other furnaces, must operate on a positive air pressure of 1½ lbs. to the square inch, which is best supplied by a positive pressure blower.

Price with blower	**$65.00**
Price without blower	**40.00**

Send for our catalogue No. 56. Tell us your requirements and we will make recommendations.

Chicago Flexible Shaft Co.

210 to 230 Ontario St., CHICAGO



One of the types of Crawford Sectional Ovens used by Manufacturers for Baking the Varnish or Protection Finish on Shrapnel and High Explosive Shells.

These ovens are equipped with the only gas burner that gives a combined radiated heat and circulation of pre-heated air in the oven.

The gas and air are mixed and combustion in the large cylinder supported by air from a positive pressure blower which gives the highest efficiency and economy known for burning either city, natural, gasoline or producer gas, and there is no exposed flame in the oven.

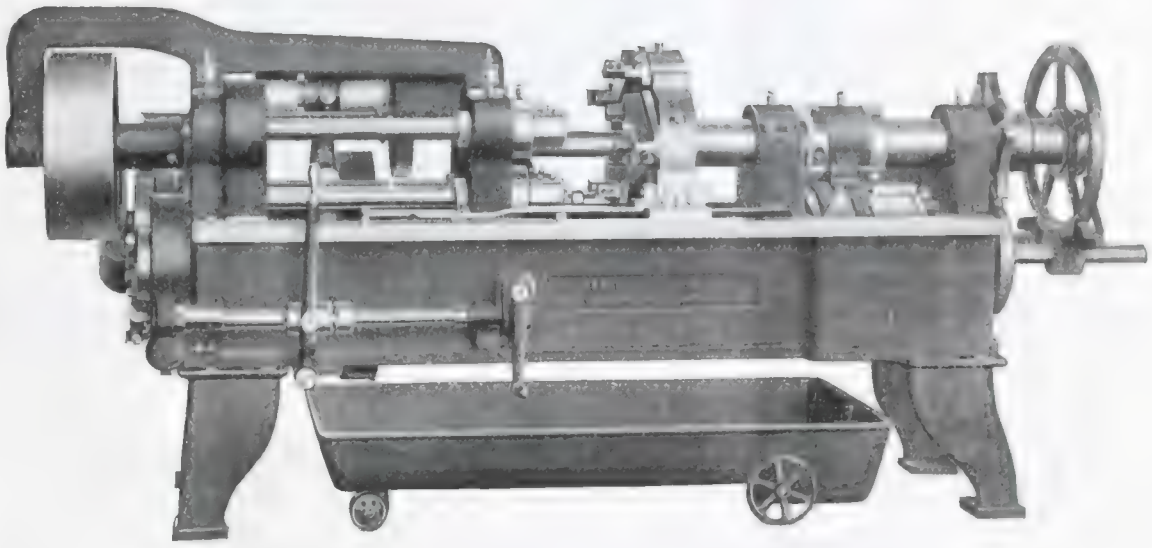
The truck shown holds (120) twenty-eight-pound shells and is planned to stand the shells on end, resting on angles. Other designs have been built for shells ranging in weight from fifteen to eight hundred pounds, the last mentioned shell being forty-eight inches high by twelve inches in diameter.

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN., U.S.A.

Canadian Representatives: THE A. R. WILLIAMS MACHINERY CO., LIMITED, TORONTO, CANADA

THE MACHINE FOR SHELL PARTS



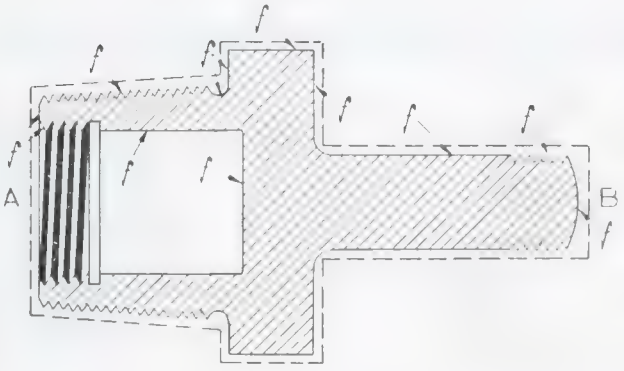
38 Time Fuse Bodies Per Hour!

Labor Cost:

79 Cents Per 100

This Time Fuse Body is machined complete at **two settings** in Size 23 Automatic Four Spindle, Single Head Chucking Machine of type illustrated above.

Outline of rough forging is indicated by dotted line on drawing.



Material:

Brass Forging

OPERATIONS

End A, Bored from solid, Reamed, Recessed, Turned Tapers, Faced, Tapped and Threaded, at the rate of **55 pieces per hour.**

End B, Turned and Faced on head and stem, Chamfered and Threaded, at the rate of **120 pieces per hour.**

The coarse, straight internal thread and the fine tapered external thread on end A were cut simultaneously by means of a combination tap and die holder. ¶ Likewise the internal and external undercuts back of threads were formed at one time by a special combination cross-cut tool. ¶ Operations on end B are performed while piece is held at end A by threaded draw-back arbor. The end of arbor pilots in large hole in end A, accurately centering the piece and insuring perfect concentricity of the two ends.

SINGLE-HEAD MACHINE IN FOUR SIZES

It is barely possible a "New Britain" could not be adapted to your work—but the odds are in its favor. Isn't positive advice on this question worth the postage required to get blueprints of your chuck work to us?

DOUBLE HEAD MACHINE IN THREE SIZES

The New Britain Machine Co.

—Automatic Screw and Chucking Machines—

NEW BRITAIN, CONN., U.S.A.

Producing Fuse Sockets and Plugs for Shrapnel Shells

Staff Article

[illegible] accuracy, and yet at a price low enough to be consistent with the temporary nature of the service required, is well instanced in the manufacture of sockets and plugs.

THE observations and [illegible] [illegible] a small factory manufacturing the component parts of the finished shrapnel shell give to the thoughtful mind a clearer conception of the energy and resourcefulness of the [illegible] when the time comes for him to develop to the utmost the equipment at his command.

The speed with which this productive power has been brought to the highest point of efficiency shows the determined interest and sterling qualities of both the manufacturer and the various artisans required to produce the necessary results.

One of the features of this great movement which is worthy of commendation is the co-operation of effort among many manufacturers to reduce to the minimum the delay often necessary when equipment is required for the completion of one or more parts of a much needed article. Often a manufacturer may be able to accomplish the required result with the exception of one operation. To do this operation it may be necessary to install expensive machinery; but if this operation can be performed in another establishment within a reasonable distance, the co-operation of these firms along the desired lines may mean much to the [illegible] outcome, as well as mutual benefit to themselves.

In the manufacture of shells, both shrapnel and high explosive, many component parts are required which necessitate their production in separate [illegible]

FIG. 1. CRUCIBLE SECTION OF BRASS FOUNDRY WHERE SLUGS FOR FUSE SOCKETS ARE PRODUCED

of the shell body. In producing the fuse sockets and brass plugs which form the nose of the finished shell, one of the necessary requirements is the brass foundry.

FIG. 2. FUSE SOCKET PRODUCTION IN THE FOUNDRY

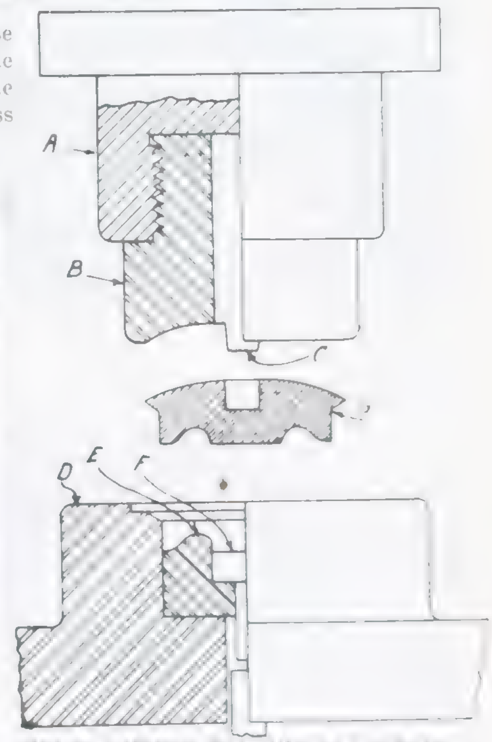


FIG. 3. [illegible]

The subject matter of this article was obtained from observation and impressions derived from a visit to a plant, which for years has been employed in the production of gas and electrical fixtures, as well as filling orders for a large [illegible]

Casting the Slugs.

Fig. 1 shows a view of the foundry where the slugs are cast before the forging operation. In this picture is shown

the crucible section where the various metals are melted before pouring into the moulds. At the extreme right and also at the left are two crucibles which have a capacity of 500 lbs. apiece; another of these is shown in Fig. 2, which is being repaired. Beside these three, there are ten others beneath the floor, each having a capacity of 150 lbs. These furnaces (of natural gas) are in operation at present 24 hours a day, metal being poured off at intervals of 15 or 20 minutes, day and night. The composition of this metal for the fuse sockets is 40 per cent. copper, 58 per cent. zinc, and 2 per cent. lead.

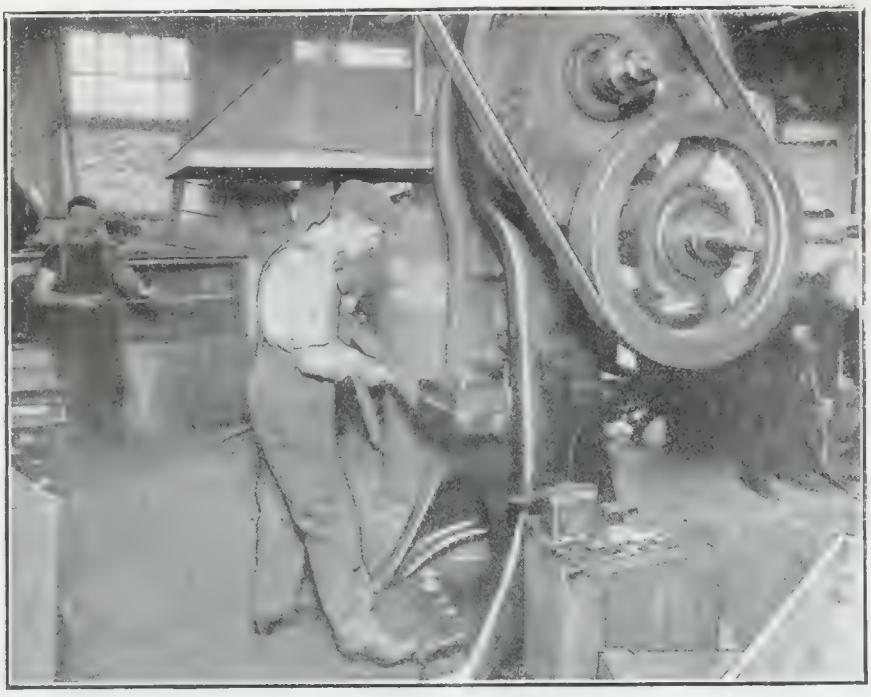


FIG. 3. TOWER PRESS FORGING SLUGS INTO FUSE SOCKETS AND PLUGS.

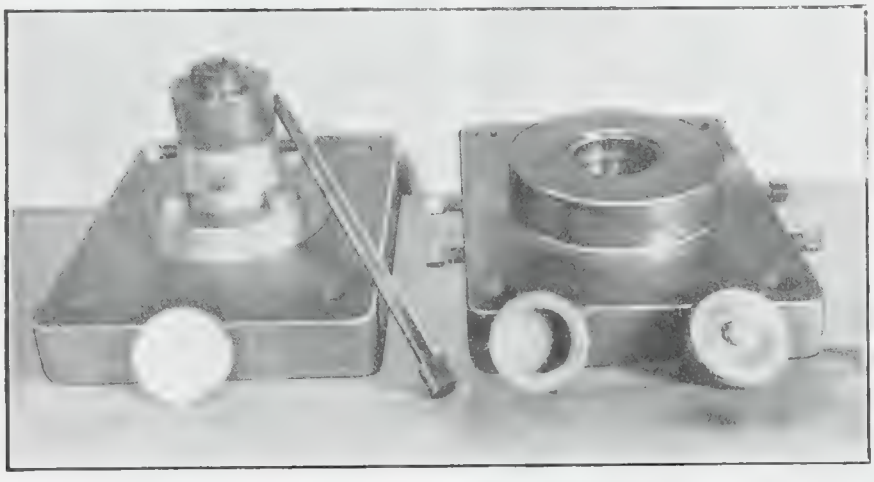


FIG. 4A. DIE FOR FORGING BRASS SOCKETS.

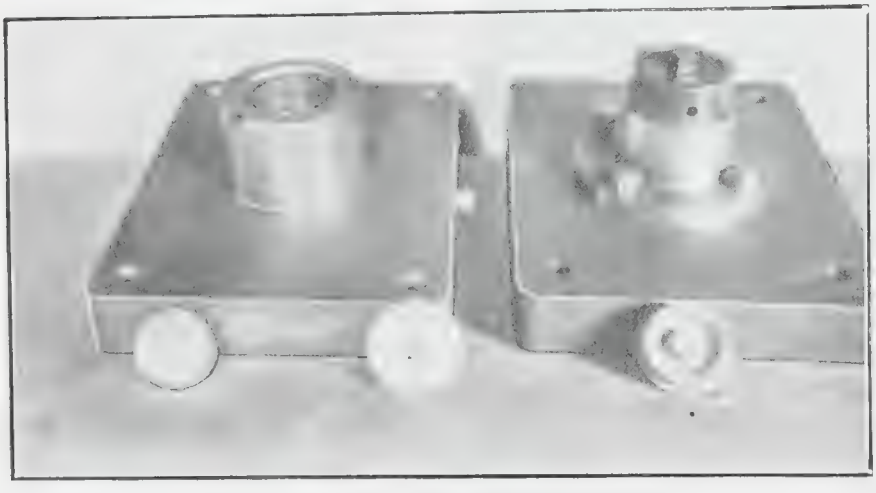
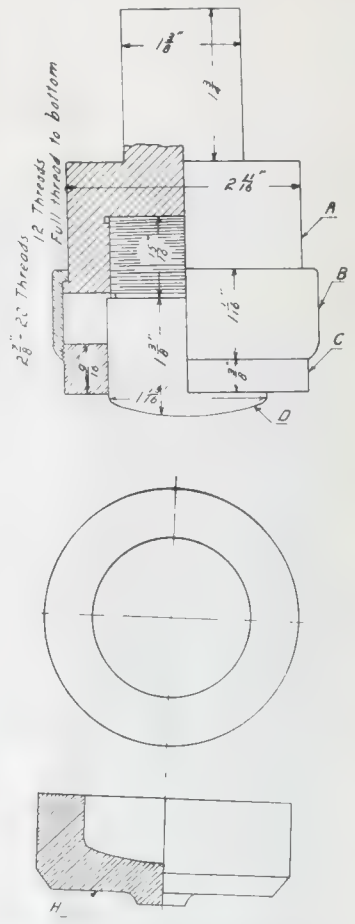


FIG. 5A. DIE FOR FORGING SOCKET PLUGS.



SECTION OF SOCKET AND DIE.

Fig. 2 shows a view of the floor and benches where the metal is poured into the various moulds previously prepared.

Forging Fuse Sockets and Plugs.

After the slugs are sufficiently cold to be removed, they are shaken out and gathered up and taken to another factory some distance away, who have a

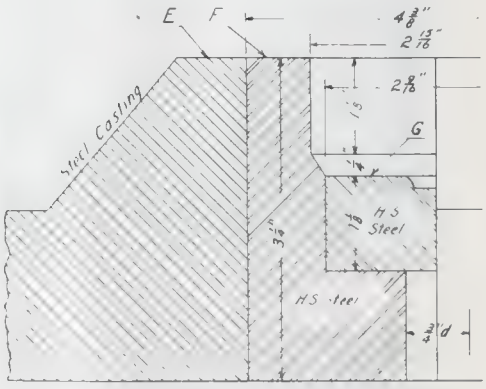


FIG. 1. DIE FOR FORGING BRASS SOCKETS.

press suitable for forging these slugs into the desired shape.

This operation is shown in Fig. 6. In the background is the furnace where the slugs are heated to a cherry red and

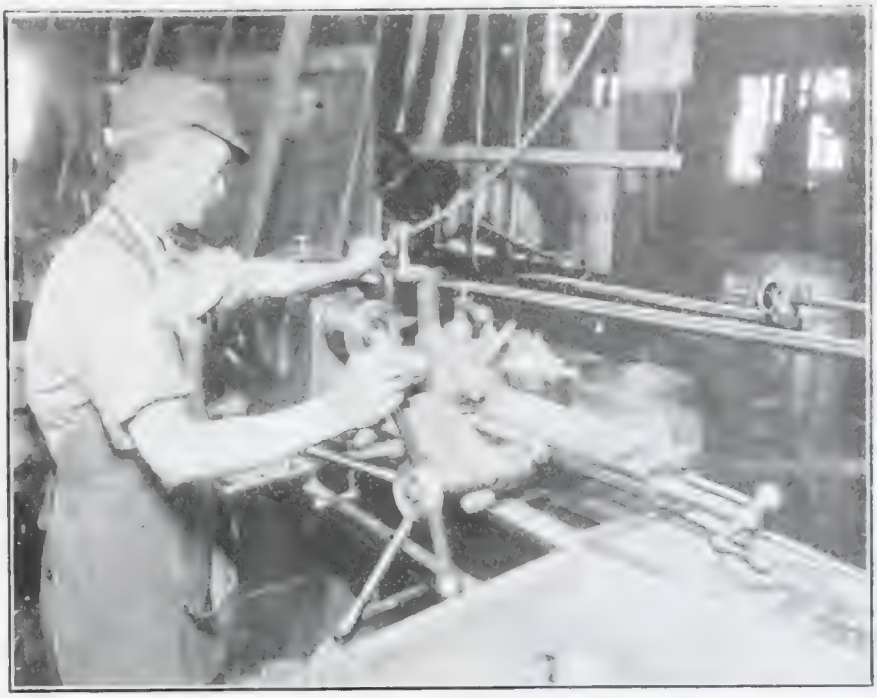


FIG. 6. FIRST MACHINING OPERATION ON FUSE SOCKETS

passed to the man at the press by means of the trough shown. This operator places the hot slug into the die and the punch upon descending forms the piece into the desired shape. The construction of these dies is shown in Figs. 4 and 5, Fig. 4 being the die for the sockets and Fig. 5 the die for the plugs. A view of the finished forging is also shown with each die; also shown in Fig. 4a and 5a.

Machining Sockets.

The first machining operation is performed on a Warner & Swasey turret machine. The cycle of operations is chucking, rough turning, tapping, finish face and ream. At periods during these operations a blast of air is forced into the recess to remove surplus cuttings; this is shown in Fig. 6.

The second operation on the fuse sockets (also done on a Warner & Swasey turret machine) is the finishing of the side which screws into the nose of the shell. This operation is shown in Fig. 7. The cycle of operations is chucking, roughing from the back, finishing from the front, and threading with the die. The sockets are then drilled and tapped for a small screw used for locking time fuse in position; they are then retapped to the finished size.

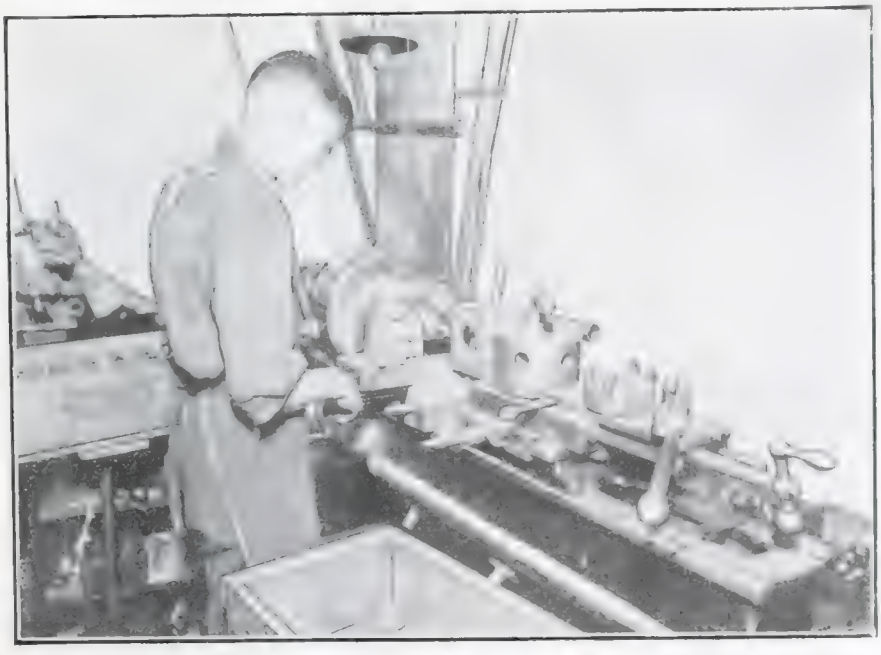


FIG. 7. FINISHING FUSE SOCKETS ON A WARNER & SWASEY TURRET LATHE

Machining the Plugs.

The work on the plug is done at one setting, the cycle of operations being chucking, roughing, undercutting and threading. This operation is shown in Fig. 8. These plugs are used to protect the fuse socket during the period of transportation, after which they are replaced by the timing fuse.

HOW METAL COOLS FROM LIQUID TO SOLID

IN [illegible] before the Sheffield branch of the British Foundrymen's Association on April 30, Dr. W. Rosenhain, F.R.S. (Head of the Metallurgical Department of the National Physical Laboratory), advanced an interesting theory, the consideration of which might enable one to understand some of the things which happen during the cooling of metals.

Special attention was given to the consideration of the existence of non crystalline or amorphous layers in metal bodies which have been cooled from a liquid condition. The "change of state" which took place during solidification involved something more than the formation of mere crystals commonly understood. Crystals invariably form at right angles to surfaces which happen to be at uniform temperatures, the growth of these crystals beginning at different points of centres termed nuclei where the temperature of the metal first reaches the freezing point. Each of these nuclei or centres then extended in all directions, meeting the arms of other nuclei and causing the crystal growth to permeate the whole body as quickly as the various parts reached the state of solidification, on freezing point.

By a crystalline body was meant one in which the particles, of which the body was composed were arranged in some regular manner. The absence of such a crystalline formation was termed an amorphous state, and science had enabled a very considerable insight to be obtained regarding the manner in which these particles were formed, as well as their absence. The growth of a crystalline structure did not result from the building up of successive layers, but by shooting out branches until these met other branches and the intervening spaces were filled up. What was it that made the atoms of the metal arrange themselves in this way? Clearly there was some [illegible] the atoms turn and arrange themselves.

and determined whether a given atom should adhere to one crystal or to another. It would appear that the attractive force acting on the atom from one crystal was greater than those acting upon it from another.

The Amorphous Theory

But ultimately a point must be reached between two growing crystals where the opposing forces of the crystal growths were nearly balanced and the atom was not impelled very strongly one way or the other, and therefore did not range itself definitely on either side. The effect of the two such opposing forces was very clearly illustrated in the attraction of iron filings by the two similar poles of a magnet (as shown by means of a slide) between which there was a distinct neutral ground where the two opposing sets of forces were so nearly balanced that the particles of iron arranged themselves in a completely indifferent manner. So in the case of a cooling mass of metal, there would be a neutral zone between any two crystals where the atoms would go on cooling down without arranging themselves in crystalline order. This amorphous or non-crystalline layer between the crystals of metal would have the hardness characteristic of all under-cooled materials. The behaviour of pure iron which would consist of crystals of iron, with amorphous layers between, was considered. The amorphous layers would be stronger and harder than the crystals themselves, and if strained or deformed there should be very little movement at the boundaries of the crystals, all the movement taking place within the crystals themselves. Slides were exhibited which showed that deformation of the body as a whole was accomplished by deformation of the crystals themselves.

A temperature of 900 deg. Cent., however, approached somewhat to the softening point of the amorphous layers, while the crystals melted suddenly and changed from the solid to the completely liquid at a much higher temperature. At such a temperature as 900 Cent., nearly all movement took place by the sliding over one another of the boundaries. Thus the flow of these metals at high temperatures obeyed the law of the flow of various liquids. To carry the process a little further, the deformation might be continued until rupture took place; in the cold metal the crystals broke across but at a suitable high temperature the crystals could be pulled apart from one another quite easily, so that the fracture followed the crystal boundaries. Several slides were shown illustrating the varying course of the fractures at different temperatures, with various metals, including purest gold, to show that the action was not attributable to the presence of impurities, as was sometimes suggested by opponents of the theory which was also confirmed by experiments in vacuum.

Experiments in latent heat also, in the opinion of the lecturer, clearly indicated differences which would be very hard to explain on any other physical ground. He was quite prepared to admit that there was no definite proof of the existence of this "amorphous cement," but some people would never be convinced until one could hit them with a piece of amorphous metal. At the same time he thought there was enough evidence to indicate that there must be something in the theory. It explained the difference in the mechanical properties of metals, which depended upon the size of their crystal structure; and the curious difference in their elastic limit was very readily explained by it. It also served to give a reasonable explanation to that most puzzling of all facts, that a very small proportion of impurities produced such enormously disproportionately large mechanical, electrical and other effects; these added bodies would always tend to concentrate themselves in this amorphous cement, and might account for the large effect of vanadium on steel. This, he thought, was one of the most fruitful applications which the theory offered, but a good deal remained to be done in working out these applications; it showed why other things injured steel, because they spoiled the binding power of this amorphous cement. Dr. Rosenhain also discussed the separation of the various constituents of alloys, the formation of solid solutions, and the formation of cores. Cores were due to the rate of cooling; only by a slow cooling could completely homogeneous crystalline aggregate be obtained. The limitation of phosphorus in steel was considered, fissures in shrapnel shells being due in his opinion to regions of low carbon and high phosphorus, resulting in layers of different hardness. The remedy was to eliminate the phosphorus as far as possible, or to render its distribution uniform. One way was to decrease the speed of solidification of the steel, and if that was impracticable, the next best thing was to anneal the steel very drastically at a certain stage in the working.

FIG. 8. FINISHING BRASS PLUGS ON FLAT TURRET LATHE.

ZINC DISCOVERED IN NORTHERN QUEBEC

ZINC in large quantities is reported to have been discovered in the vicinity of Burbridge Lake, in the Upper Gatineau district, Quebec, north of Ottawa. Denis Callahan, a Haileybury prospector, recently found evidences of this mineral in that part of the Laurentian hills, and engineers will investigate.

John D. Macfarlane, a mining engineer of Shawville, who was in the capital on his way up to look over the locality, believes it possible that zinc will be found there in considerable quantities. He is familiar with the country, and reports already made indicate that the deposits may prove as valuable as those now controlled by the New Jersey Zinc Corporation in that state. Conditions in the Burbridge Lake district are reported to be similar to those existing where this corporation has its wealthy deposits. Zinc is selling at very high figures just now on account of its use in the manufacture of war munitions.

Autogenous Welding with the Oxy-Acetylene Blow Pipe

By C. Rover*

Welding by means of the oxy-acetylene process is a method of repair which may be adopted in connection with almost any description of metal work. The possibilities possessed by it as a manufacturing process have not, however, been fully recognized, and it is in this direction that further future developments of the art are most likely to take place.

THE successful application of autogenous welding in very many instances has proven to the industrial world the great utility of this process. The possibilities of this process are continually being demonstrated in hundreds of workshops, where its successful application in daily work indicates the almost unlimited field of usefulness which the future holds for it.

Electrical, Chemical and Autogenous Welding

Before proceeding with the subject of this lecture, it might be desirable to mention the subject of electric welding. Electric welding consists of the application of electrical energy in such a manner that the temperature of the work will be raised to the desired point in two ways, either by causing the work or certain parts of it to form a resistance circuit and be heated by the effort of the current in overcoming the resistance, or by striking an arc between a suitable electrode and the part of the work to be welded.

In the first case, the two parts to be welded are pressed together, and the current supplied through electrodes on either side of the contact joint, the resistance of which causes local heating of great rapidity, which soon reaches welding point, when the two parts are inseparably united at the point of contact.

*Paper read before the Montreal Branch of the Canadian Society of Mechanical Engineers, Montreal.
*Manager of L'Air Liquide Society, Montreal.

PATCH WELDED IN.

Spot welding is the best example of the resistance process, and is very serviceable where large quantities of similar parts are to be handled.

The arc process possesses some peculiar advantages, due to the fact that its rapidity of action serves to eliminate the large amount of expansion and contraction, which in some cases militate against the success of autogenous welding. The successful application of the arc-process depends largely on the type of apparatus, many of which have been designed, but all of which have not proved an unqualified success. The advantages of the arc process are sometimes offset by the changes which take place in the metal, the resulting difference between the welded region and adjacent parts being occasionally very marked in regard to such features as hardness, brittleness, and elongation.

INSTALLING FREEZING COILS WITH WELDED JOINTS IN AN ARTIFICIAL ICE SKATING RINK

The Thermit Process

This is strictly a chemical process, and depends on the fact that when powdered aluminum is intimately mixed with iron oxide and a small portion heated to a suitable temperature, the aluminum combines with the oxygen and releases the iron. This reaction is accompanied by intense heat, the iron being turned into a molten mass, which is available for use in a welding mould, as used in scoop welding. Although limited in application, its reliability and capabilities render it indispensable in certain classes of repair work.

Blow Pipe Processes

The general use of the blow pipe as a means of welding is of comparatively recent occurrence, but it has firmly established itself as a recognized branch of industrial activity. Its most interesting features are the large variety of work which it can perform, and the number of different metals which can be united by means of it.

Comparatively little expense is involved in the installation of a plant for any particular line of work, while the fact that this process alone is capable of use on cast iron, steel, aluminum, copper brass, bronze, etc., renders it unique among welding processes.

Although several combustible gases

PATCH CUT OUT.

have been proposed for use in the blow pipe, experience has shown that acetylene gas is the most suitable.

BROKEN PRESS FRAME

Oxy-Hydrogen Flame

The possibilities of oxygen and hydrogen for blow pipe work were first tried out on a commercial scale in 1901. The combustion of hydrogen in oxygen results in the generation of a large amount of heat, 350 British thermal units being released for every cubic foot of hydrogen consumed. At the same time, a proportion of water is formed in the shape of vapor.

Theoretically, two volumes of hydrogen and one volume of oxygen are necessary for perfect combustion. Practically, a flame of such composition is unsuitable for welding, due to the presence of water vapor, which is decomposed by contact with the hot metal; the oxygen combines with the metal to destroy its quality and impair the reliability of the weld. This action may be avoided to some extent by using an excess of hydrogen, in some cases 4 to 1, but this waste is accompanied by a lower flame temperature, so that except for very light sheet steel work the use of the oxy-hydrogen flame is almost discontinued.

Acetylene Gas

The use of acetylene gas had also been proposed in 1901, and its economy of operation, combined with its wide field of application, has resulted in its universal adoption by autogenous welders.

Acetylene is an endothermic gas which gives 1,630 British thermal units per cubic foot, 270 of which are due to the heat of dissociation. By weight, acetylene consists of 92.3 per cent. carbon and 7.7 per cent hydrogen. When one volume of acetylene is burned with one volume of oxygen, carbon monoxide and hydrogen are formed, and burn in the shape of a small bright cone in the centre of the flame. Towards the outer part of the flame these bodies combine with a portion of the oxygen of the atmosphere, presenting a different appearance from the central cone.

While 2½ volumes of oxygen are theoretically necessary to burn one volume of acetylene, only one volume of oxygen need be supplied to the blow pipe, the atmosphere supplying the balance. The large proportion of carbon monoxide and free hydrogen in the oxy-acetylene flame have a reducing action, which renders the flame perfectly neutral and non-injurious to the work.

Autogenous Welding

The use of combustible gases to generate heat in such a manner that it can be applied locally with a blow pipe or torch is the distinguishing feature of autogenous welding. The remarks which follow are based on the use of acetylene gas, combined with oxygen.

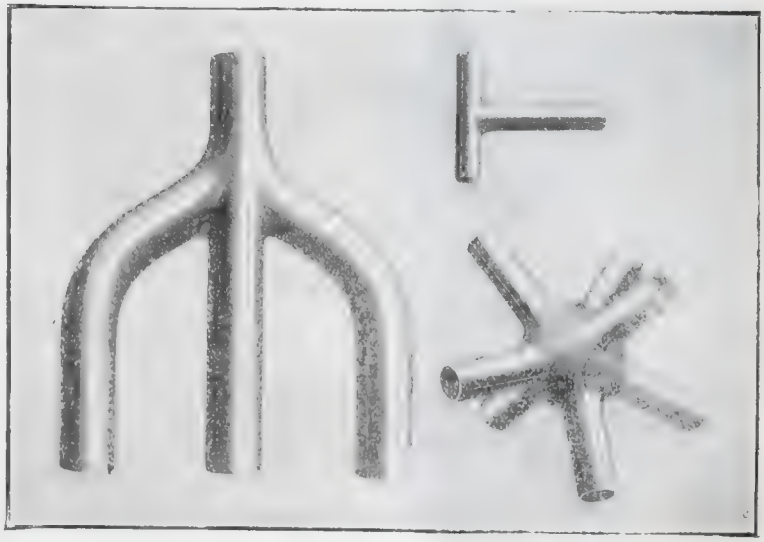
PRESS FRAME REPAIRED

Oxy-acetylene welding is the art of so applying the heat of combustion to the work that a welding temperature is quickly obtained and maintained until the material is in a state of fusion, which then permits the union of surfaces or parts, the building up of areas, filling of cavities or hollows, the removal of metal, and cutting apart of various shaped bodies. Steel plates up to 1½ inches in thickness and round or square bars up to 6 inches in diameter can be welded with the blow pipe without alteration to the chemical or physical characteristics of the material.

Oxy-Acetylene Equipment

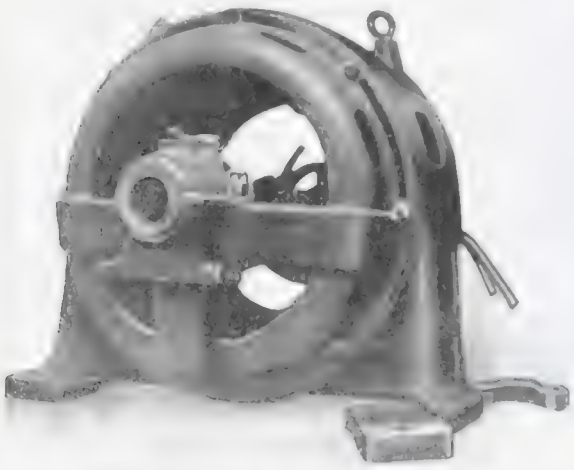
The necessary equipment consists of a

HEATING WITH BLOW PIPE TO REMOVE PROPELLER



BUILT UP COPPER PIPES

blow pipe with various sizes of welding burners, and a supply of oxygen and acetylene, the two gases being compressed [illegible] steel tanks or cylinders.



[illegible]

Compressed oxygen is readily obtainable in most industrial centres, while tanks containing dissolved acetylene are familiar to every automobile user. These tanks contain a porous substance saturated with acetone, which is a liquid possessing the power of absorbing acetylene gas when supplied under pressure. As a result of this a greater quantity of gas can be stored at a less pressure, and in smaller space than when compressed alone. Generators are also used in which the acetylene gas is formed by the action of water on calcium carbide. They are desirable in large permanent installations, but for general work, the portable plant has many advantages.

Repair Work

The most widely known field for welding is in repair work. In many cases re[illegible] to the none-stop[illegible] more than the direct savings due to repairing instead of replacing.

Consideration must be given to all these features before de[illegible] that a [illegible] can be profitably performed by welding. When heavy sections have to be operated on, the cost increases rapidly, while the effects of expansion and contraction have to be [illegible] carefully designed, and [illegible] by various methods and devices.

Cast Iron

With suitable equipment and materials, a capable operator can weld cast iron parts, the joints between which will have a strength of more than 100 per cent. of the original material. This is due to the use of feed rods of better quality material than the work. In order to avoid hardness in the welds it is necessary to use feed rods rich in silicon, i.e., about 5 per cent., and take all precautions against too rapid cooling.

Cast iron, having no elongation, is not suited to withstand stresses produced by unequal heating, and in most cases it is necessary to pre[illegible]

[illegible]

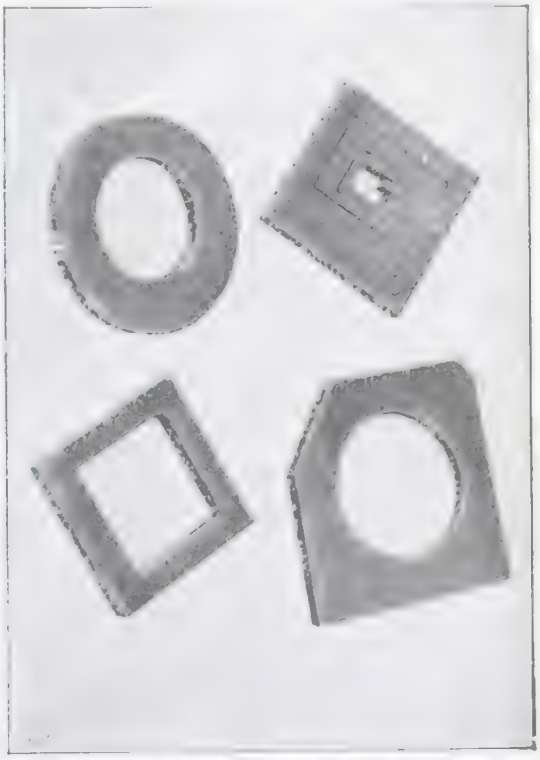
Even preheating does not always overcome this trouble with cast iron and [illegible]

operator is required to insure the production of good work.

Steel

A [illegible] should always show above 85 per cent. of the original strength. The mere fact that an operator fuses a piece of feed rod and allows the drops to fall on comparatively cool metal does not constitute welding. It is only adhesion. A careful welder will have all surfaces at [illegible]

REMOVING RIVET WITH BLOW PIPE



EXAMPLES OF WORK DONE WITH OXY-ACETYLENE BLOW PIPE

CUTTING OFF HEAVY RISER

flame, by the proper use of the hammer at the right moment he will improve the grain of the metal, and by further use of the blow-pipe, he can so anneal the work that the efficiency of the joint may be as high at 95 per cent.

In addition to cast iron and steel, oxy-acetylene welding is largely used for welding brass, bronze, copper, aluminum, and other metals. Its use in cutting up structural work such as bridges and buildings in course of demolition is a very great saving of time over the old laborious hand cutting. After heating a suitable spot on the plate or beam to melting point, the acetylene gas is turned off, and a stream of pure oxygen is played on the heated metal causing it to melt and at the same time generate enough heat to allow the action of the oxygen to be continued along the desired line until the piece is cut through.

The removal of risers and feeders in foundry work is an everyday application of the process.

Manufacturing Applications

The application of autogenous welding to the making of steel barrels, tanks, etc., has been carried out with considerable success, but a large field of usefulness has so far only been touched. For articles made of plate up to ⅜ inch thick it is very suitable, making a perfectly tight joint which requires no caulking, is cheaper than riveting, and presents a better appearance.

In the manufacture of steel and iron pipes, flat strips are rolled to shape and welded by an automatic machine. This process is used in making water and gas pipes, bicycle tubing and bedsteads.

By means of oxy-acetylene welding, water, steam and gas pipes have been reduced in thickness as threaded joints are eliminated. Many installations of complete systems have been made without a screwed joint, the joints being welded while in position. Very few fittings are required, as a hole can be cut in a pipe and a branch welded on. The welding of flanges to pipe is also another great advantage.

The construction of heating boilers by welding together parts made of steel plates, has been greatly developed also the construction of radiators by the same method. Other applications which can be made include the following:—

The construction of steel cars, doors, frames, window sashes, etc.

Poppet valves for internal combustion engines.

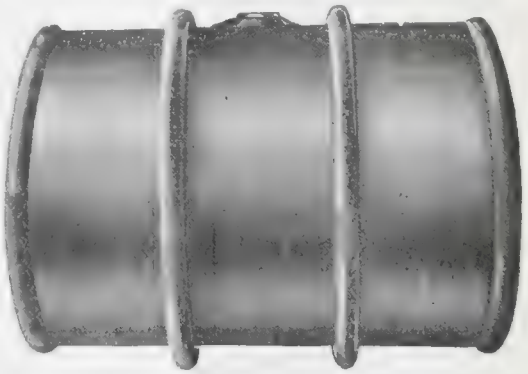
Cement pipe lines where the liners are shells of light gauge steel.

CUSTOMS RETURNS HIGHER

AN increase of over two millions in Customs receipts is the healthy condition shown by the figures issued for September by the Department of Customs.

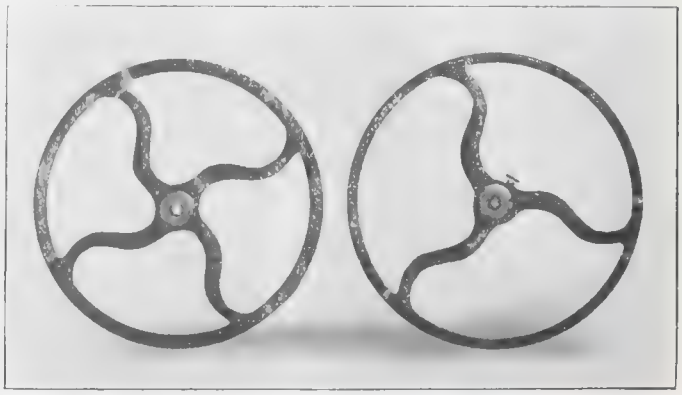
For the month, receipts totalled $8,029,665, as compared with $5,919,273 in September of last year, or an increase of $2,110,391. For the six months, ending September 30, of the present fiscal year, receipts have been $44,760,830, as compared with $43,044,913, an increase of $1,715,917.

This indicates that for the first half of the 1915 financial year, at least, the Customs revenues have been swelled by the tariff increases of last season to the extent of almost two millions. As it usually takes some time before Customs taxes have their due effect, the showing for the last half of the year is expected to be even better. It must be remembered in comparing the first six months of this year with those of 1914 that the latter period includes but two months of war.



WELDED STEEL BARREL

The pressure in the chamber of a gun at the moment of discharge of the shell is about 25 tons per sq. in.



PARTS OF BROKEN PULLEYS SUCCESSFULLY REPAIRED WITH BLOW-PIPE

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

MOLDING A LARGE ACCUMULATOR BASE

By J. H. R.

THE St. Lawrence Iron Foundry Co., of Montreal, Que., [illegible] a specialty of supplying all kinds of iron castings to the trade are at the present time remodelling a portion of their plant and equipping same for the machining of 4.5 high explosive shells. They will, however, continue to develop the foundry end of their business, and in order to give your readers an idea of the nature and scope of same, the molding features connected with the production of a large accumulator base casting are here detailed and illustrated.

This casting, which will weigh in the neighborhood of 17,000 lbs., is for the base of one of the largest accumulators yet built in Canada, and which is being constructed for the Montreal Ammunition Co., by the Canadian Boomer & Boschert Press Co., of Montreal. The accumulator, when completed will furnish a pressure of 1,500 pounds per sq. inch to hydraulic presses engaged in the drawing of shell cartridge cases. The casting will consist of 25 per cent. steel, which is obtained from the use of the discarded shells and shell ends from shell making plants. The pattern for this base casting was of the skeleton type, being quite satisfactory in view of the fact that only one casting would be required.

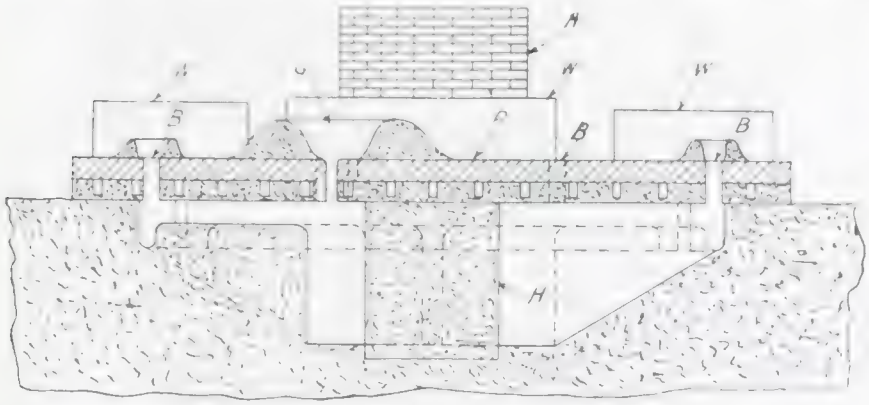


FIG. 1. SECTION THROUGH GREEN SAND MOLD FOR ACCUMULATOR BASE.

Preparing the Mould

The mould was prepared as shown in Fig. 1. A pit was dug in the floor and the pattern set into it, and levelled up. Green sand was shoveled in and thoroughly rammed, care being taken to have the sand of uniform density at all points. As there was no base to the pattern the openings between the ribs made it easy of access.

When the spaces between the ribs were completely rammed, the surplus sand was removed by sweeping the surface above the ribs leaving the space for the metal at the base of the casting. The sand having been levelled off, the pattern was carefully removed, the moulder and his helper afterwards cleaning up and smooth facing the various surfaces. A view of the mould at this stage is seen in Fig. 2. As it was not thought advisable to construct a special cope the method shown in the figure was adopted as this had proved satisfactory in former cases.

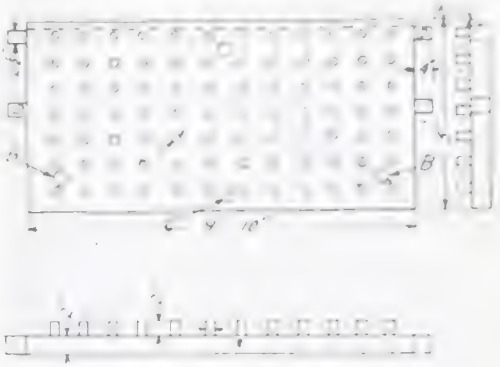


FIG. 3. COPE PLATES.

Special Cope Plates

Two plates of cast iron, weighing

FIG. 2. COMPLETED GREEN SAND MOLD FOR ACCUMULATOR BASE.

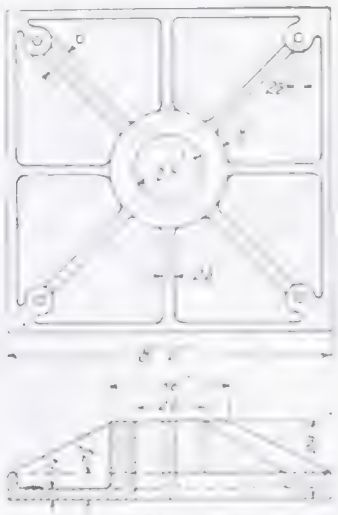


FIG. 4. ACCUMULATOR BASE.

about 2 tons each and similar to that shown in Fig. 3 were cast. Pins A which protruded about two inches from

the main plate and were about one inch in diameter were placed irregularly about the surface for the purpose of retaining a layer of sand spread over the surface and which was rammed up and surface levelled by placing the plate in the framework shown to the right is Fig. 6. This thickness of sand amounted to about 2½ inches. Cored holes B were put into the plate so as to come directly over the corners of the casting and be just outside of the boss as shown in Fig. 4, which is a sketch of the finished casting. The holes C were for inserting eye-bolts for convenience in handling, while the lugs D, were used for turning the plate over when the sand facing was in place.

Arrangement of Mould

The arrangement of the mould for producing these plates, two of them being used, is shown in Fig. 5. A space sufficiently large was cleared on the floor and the sand rammed to an even density. A skeleton frame was used to make the required plate dimensions which were about two inches thick by nine feet ten inch by five feet. When placed over the mould as shown in Fig. 1 there was a bearing of 10 inches all around the edge.

The object of making two plates in place of one was for convenience in handling. It will be noticed that the plate edges which come together in the centre of the mould as shown at N are bevelled. This is for the purpose of securing a good close joint with little labor. When the plates are butted, the trough formed by the two bevels is rammade with a little waste and sand thus securing a close joint and avoiding fins or burrs, which would be liable to appear if the plates were left the full thickness at their edges.

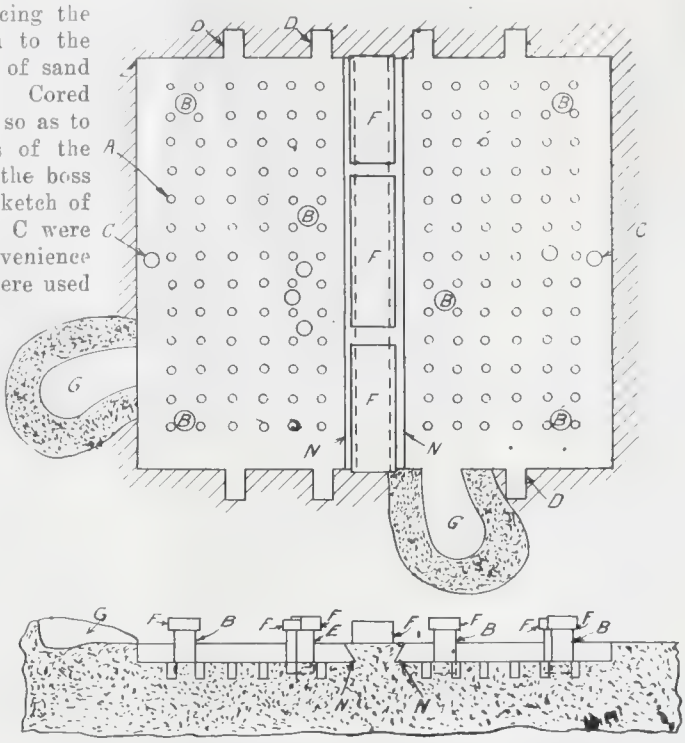


FIG. 5. GREEN SAND MOLD FOR COPE PLATES

The layout of this mould is shown in Fig. 5. The cores B are for the risers while those at E were for the runners from the pouring basin when placed over the mould Fig. 1. The pouring basins G were placed to one side of the moulds. The cores were prevented from shifting by means of the weights F. A view of the mould in readiness for pouring is shown in Fig. 6.

Accumulator Base Casting Mould

A sketch of the mould for the accumulator base casting is seen in Fig. 1. After the mould is prepared as per Fig. 2, the plates with their facing of sand are placed in position and the basins for pouring and risers arranged. The weights W, together with that of the plates, amounted to about ten tons. The plates at the centre rested on the 20-inch cove H, which extended up level with the base of the cutting.

Pouring

The largest ladle in the shop which was handled by a 5-ton "Whiting" crane had a capacity of only 5 tons. It was, therefore, necessary to provide some means of continuous pouring. The brick bosh A shown at the rear of Fig. 1 was constructed of sufficient size to hold about 4 tons of iron and this was filled with molten iron while the 5-ton ladle

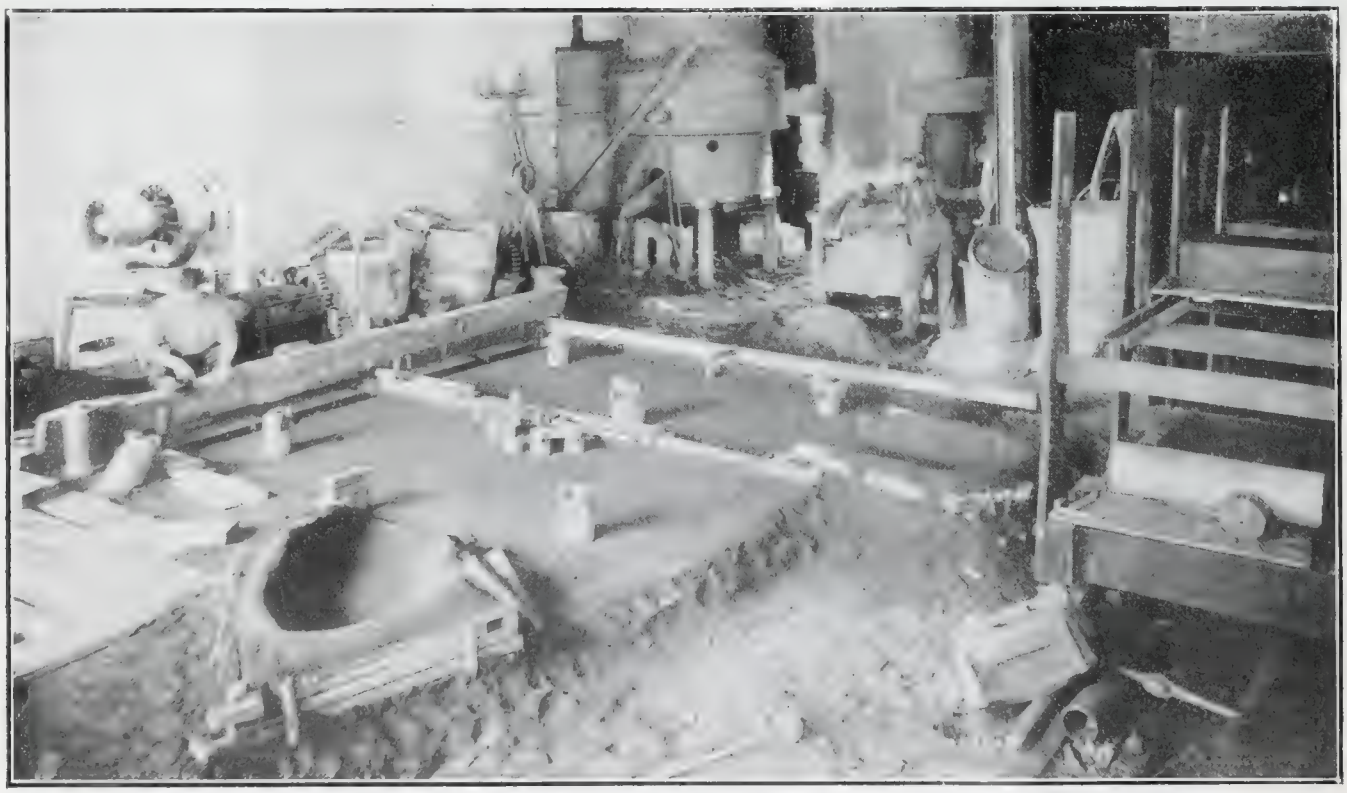


FIG. 6. GREEN SAND MOLD FOR COPE PLATES IN READINESS FOR POURING.

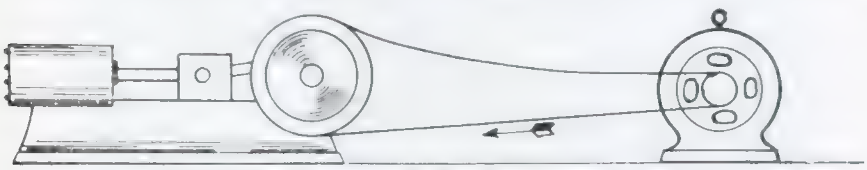
was being poured. When the 5-ton ladle was emptied, the bosh was tapped, and while the metal was running in the ladle was being refilled.

One of the problems which confronted the foundry foreman was the removal of the casting after cooling, as the 5-ton crane was not deemed capable of lifting a casting which was expected to weigh between 8 and 9 tons. One side was raised at a time by which process it was gradually turned over on to a track prepared with special rollers. It was then removed to the Canadian Boomer & Boschert Co. shops across the road in which the accumulator was to be erected and completed.

CONCERNING BELT SLIPPAGE

By N. G. Near.

ANSWERING R. McLaren, who says he is "still unconvinced that a slipping belt necessarily means fuel waste," I do not know how I could explain the matter more simply than by use of the hoisting engine.



CONCERNING BELT SLIPPAGE

[illegible]

This is the principle upon which all Prony brakes are made, and this principle is used in running all "Prony" brake tests. Therefore, when the slip of a belt becomes 100 per cent., the belt will not move the driven pulley at all and the whole arrangement becomes a veritable "Prony" brake.

With reference to the hoisting engine, Mr. McLaren says:

"We will assume that the weight is suspended from the drum by a cable and that the cable slips on the drum, the tension being adjustable in a manner similar to the brake band. We will assume also that the drum has a radius of 1 ft. and that it turns at the rate of 100 r.p.m. The power required to hold the weight stationary would be $(2 \times 1 \times 3.1416 \times 100) \div 33000 = 628.32$ h.p. How then would he cause the weight to rise?"

It is a fact that the weight of 33,000 pounds cannot be raised without some additional power because nothing can be set in motion from rest without the exertion of some force acting through distance. An additional hundredth, thousandth or millionth of a horse power will therefore be sufficient to raise the weight. To raise it rapidly, however, may require an additional 25 or 50 h.p., and this can easily be computed from the familiar formula, F = Ma, where F = force, M = mass, a = acceleration given to the 33,000 pound weight.

It is, therefore, evident that should the engineer so choose, and should he happen to have that amount of energy available, he could expend an additional 1,000 h.p. or more in raising the weight.

It is true, as Mr. McLaren says, that running the engine faster or increasing the tension in the cables, will accomplish the desired end, and either operation will require more steam.

No, I would hardly claim that it is easier to climb a stair than to walk along a level floor. When you climb a stair you store potential energy within yourself, and it requires work to do that, but when you walk along a level floor, the summation of all the work done by one's self on one's self is zero. No work is done at all.

The Gas Engine Example

As for the gas engine, let me explain in detail why each per cent. of belt slip on gas or gasoline engines represents a fuel loss of more than one per cent. I refer here only to gasoline engines that fluctuate violently.

The tension in the belt here is 1,000 pounds only because the load does not require a greater tension. Should the load be greater, the tension would of itself become more than 1,000 pounds, and there would be no slip, but, there is a limit. Let us suppose that the belt slips at 1,100 pounds. This tension is reached when the engine "jerks," due to the sudden explosions, and, during the instant of slip, the tension of 1,100 pounds is doubtless maintained. More energy is being taken from the engine, then, during the instant of slip than during an instant of normal pulling, and I therefore naturally conclude that the full consumption is greater, due to slip, than if there were no slip.

The best way to eliminate this loss is to make the fly-wheels so heavy that the fluctuations will not be violent enough to cause belt slip, or, the explosions may be made frequent enough to produce the same effect.

I trust I have now made myself perfectly clear.

POINTS ON RUBBER BELT CONSTRUCTION

BRIEFLY, the process of belt manufacture is as follows:—Cotton duck, of such weight and strength as is required for the work to be done, is frictioned or coated with rubber upon the calender. The quality of the rubber, like the weight and strength of the cotton, varies according to the nature of work to be done. The frictioned fabric is then cut into definite widths, according to the width of the finished belt, after which the plies of fabric are built up either by folding or laying ply upon ply or a combination of both.

After the belt is built up and the cover applied, a seaming strip of high-grade rubber is laid over the outside joint in order to weld this joint firmly together and prevent separation or opening up of the seam. The raw belt is then rolled upon a shell and given a slight cure in open heat in order to vulcanize the edges. After the "first cure" the belt is carefully vulcanized between the polished plates of a powerful hydraulic press. The rubber is forced into the duck, and the whole belt becomes perfectly smooth and firm. Just prior to vulcanizing, the belt is stretched under great pressure, thus minimizing stretch when the belt is put in actual use.

Rubber belts should be run at not less than 200 ft., nor over 5,000 ft. a minute, a good average being 2,000 ft. Shifters should not be used, as, once the edges of rubber belting are worn through, the plies readily separate. All animal oils and greases are injurious to rubber belting.—Practical Engineer.

BRITISH EXPORTS TO CANADA DECREASE

THE following are the cabled figures from London, of trade between Canada and Great Britain in the undermentioned articles during August:—

Imports From Canada

	Aug. 1915	Aug. 1914
Wheat	[illegible]	[illegible]
Wheat meal and flour	238,132	147,889
Barley	[illegible]	[illegible]
Oats	[illegible]	[illegible]
Bacon	278,791	129,404
Hams	[illegible]	[illegible]
Cheese	[illegible]	[illegible]
Canned Salmon	[illegible]	[illegible]
Canned lobsters	28,964	53,622

Exports to Canada

[illegible]	[illegible]	[illegible]
Wool	[illegible]	[illegible]
Pig iron	[illegible]	[illegible]
Wire	983	2,948
Galvanized sheets	5,118	18,241
Tinned plates	2,099	5,403
Steel bars	4,494	7,134
[illegible]	[illegible]	[illegible]
Cutlery	[illegible]	[illegible]
Hardware	[illegible]	[illegible]

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

SHELL MACHINERY IN FRANCE

THE fact that the French nation is mobilized to a man for the purpose of producing shells as well as actual fighting is of particular interest to our readers at the present moment. Our allies were alive to the necessity for extraordinary shell production long before it was realised by ourselves, and the efficient manner in which munitions manufacture was tackled and made a national problem has already earned the admiration of not a few British engineers.

Previous to the outbreak of hostilities, the firm of Alfred Herbert, Ltd., of Coventry, Eng., enjoyed a widespread business with various European nations, but since then, their activities have been limited to certain countries. One of their travelling operators in France has done excellent work in the designing of shell machinery which has been made by the firm's customers in France. His description of conditions and methods which we reproduce are from the house organ of Alfred Herbert Ltd.

In the first place the various works in the country were grouped, the shops in each group working in conjunction with each other, while an expert engineer was put in control of the group.

Contracts were then given out to the controller of each group, who divided and sub-divided the work amongst the establishments under his control, according to the capacity of each shop. Machine tools changed hands according to the work given out; for instance, a particular shop had a few automatic machines, but not enough to undertake a large contract for shell bodies. These automatics were thereupon transferred to another shop which had more of the same type, while the latter sent some of its smaller machines to the first.

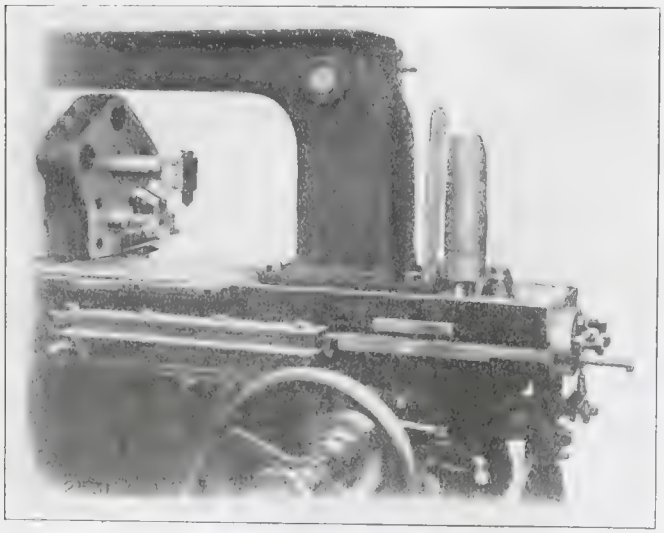


FIG. 1. 75 MM. H. E. SHELL, WITH SECTION CUT FROM NOSE.

With a large number of automatic machines, the second shop could turn out a large number of shell bodies in an efficient manner, while the first shop was put into better shape for handling fuses and grenades.

At the same time, it was no easy matter to switch all these works over from building motor cars, locomotives, etc., to shell and gun production. Tools were a great problem, but it was not allowed to remain a problem long. One or more works in each group was told off to act as a sort of tool room to the rest, a plan that has worked very satisfactorily.

Automatic machines are not being used for turning and boring shell bodies to any great extent in this country, but our French allies have turned to account any and every machine they could lay their hands on.

Although we are not allowed to mention names, it is by the courtesy of the controller of one of the aforementioned groups, that we are permitted to publish the accompanying illustrations with particulars of the tools used for producing 75 mm high explosive shells on our Nos. 4 and 6 Automatic Turning Machines.

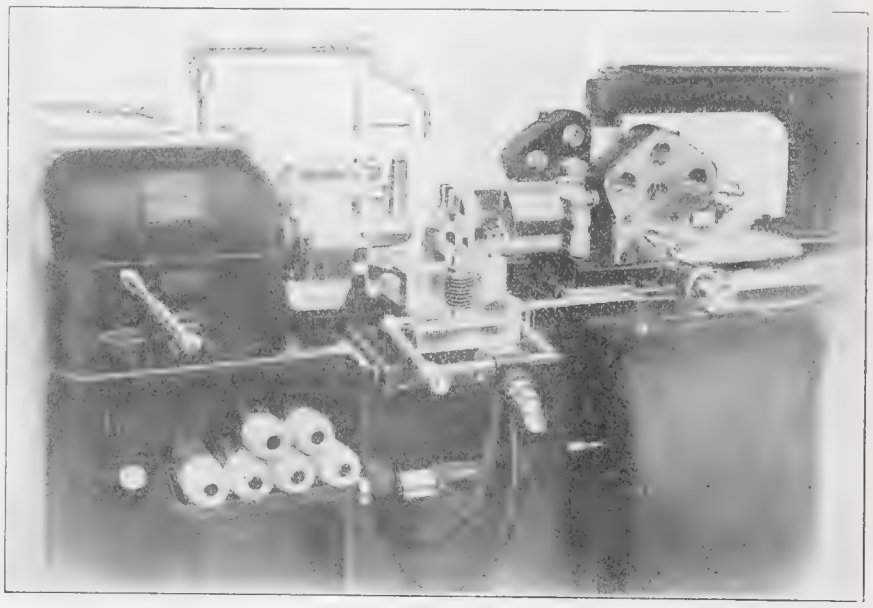


FIG. 2. ROUGHING BOX TOOL AND PROFILER.

The French 75 mm high explosive shells are made from forgings. These are first rough turned and finish bored previous to a closing-in operation. After the nose has been closed-in the shell bodies are delivered to the Automatic Turning Machines for the finishing operations. It should be noted that during the first rough-turning operation, the boss at the closed end of the shell is turned to a definite size with limits either way of 0.008 inches.

This boss is made use of after the closing-in operation, for holding the shell body true in the chuck.

In the first operation on the Automatic, the shell body is held in soft jaws, mouth outwards, while a special draw-in chuck fitted in the spindle, grips and holds true the boss on the end of the shell.

The shells are located by the bottom of the hole, using a device that gives a definite length from this point to the front of the chuck jaws.

The box-tool shown in position in Fig. 2 first turns the shell body to about half way down. The special radius tool

[illegible] next turret face. At the same time the [illegible] in Fig. 3.

This illustration also shows the special [illegible] tailing the mouth. Owing to the necessity for fitting the profiling tool to the front cross-slide, this recessing tool has [illegible]

[illegible] finish-turned nose effectually prevents the shell from running out of truth.

[illegible] turned with tools in the turret. The [illegible] cross-slide and the outside of the shell between the band groove and the closed [illegible]

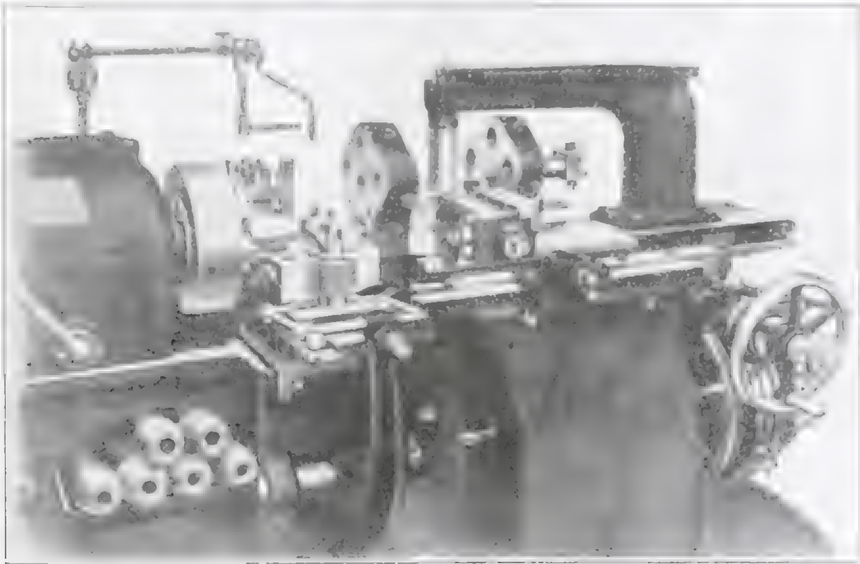


FIG. 3. PROFILING TOOL IN OPERATION

was, however, found necessary to have the tool inverted so that the spring and lever feed reversing mechanism seen in the illustration, Fig. 3, was adopted, and works very well.

In the second operation the rear portion of the shell is finished. Owing to the manner in which the lengthwise limits of the shell are specified, it was found impracticable to locate the shell by the mouth; the best way and the one adopted is to fit a bush in the machine spindle, boring this out to suit the profile of the shell nose. The shell is

[illegible] former carried in the front cross-slide.

The special knurling apparatus, seen in Figs. 4 and 5, is then used for serrating the bottom of the band groove.

The total time for both operations, including chucking and removing, is 17 minutes, the speed at which the shells are turned being approximately 66 feet per minute.

The roughing tools used last for about 30 shells, while the finishing cutters will machine 60 or more before they require re-grinding.

Re-setting the tools after sharpening takes 10 minutes for the roughers and [illegible] a total output of about 38 shells per day of eleven hours per machine.

[illegible] on 75 mm shells.

For profiling the nose however, it is necessary to take two cuts, roughing and finishing. These two cuts take place simultaneously, a double slide arrangement being mounted on the turret, the two slides being guided by formers held in the front and rear cross-slides.

[illegible] the shell, this operation is completed in 20 minutes.

GLASSES FOR EYE PROTECTION

[illegible] are becoming more insistent with the widespread use of apparatus for such processes as oxy-acetylene welding, electric furnaces of various types, and all metal manufacturing processes which involve the exposure of operators to direct heat and light rays of considerable intensity. In a report on investigations regarding the provision of suitable glasses for eye protection, in a recent issue of the Iron Trade Review, M. Luckiest, of the National Lamp Works, presents a number of interesting facts relative to light and its control.

The energy which is radiated from all hot bodies into the surrounding media is sent forth inpulses or waves. In a manner similar to that of a wireless receiving station, the eye is physically capable of perceiving pulses or waves of a certain definite frequency or length, name from 0.39 micron to 0.75 micron, a micron being a small unit of measure- [illegible]

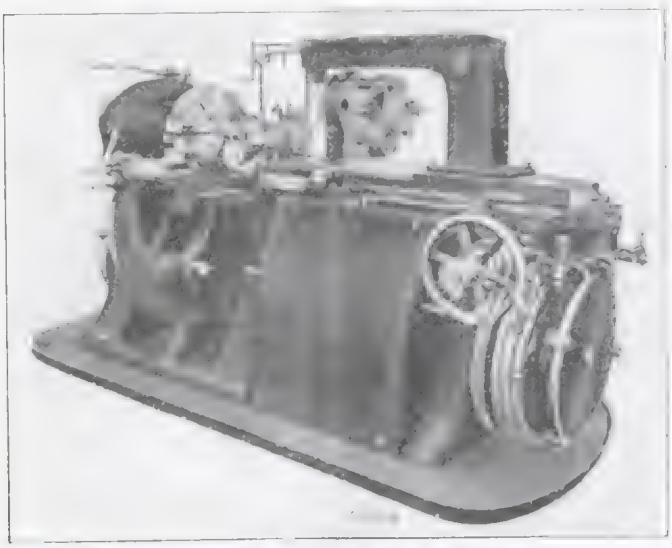


FIG. 4. [illegible] AND KNURLING.

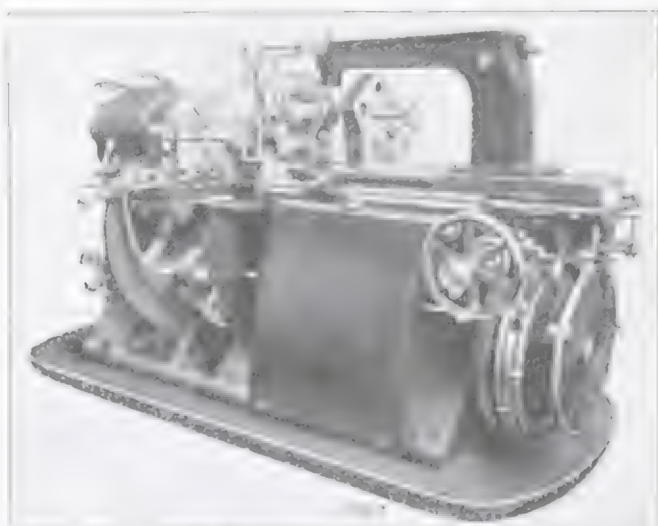


FIG. 5. SHOWING KNURLING AND [illegible] TOOLS.

of a millimeter. These limits constitute what is known as the region of visible spectrum.

Various Kinds of Rays

A hot body before it has reached a sufficiently high temperature to become luminous, gives off only what are commonly known as "heat" rays. As a matter of actual fact, all rays, whether visible or invisible, when absorbed by a medium, produce heat in that medium. As the temperature is increased, visible rays begin to emanate from the heated body. Further increases in temperature cause ultra-violet or chemical rays to emanate, the relative amount of the various kinds of rays emitted depending not only on the temperature of the body, but also on the substance of which it is composed.

The ultra-violet rays, that is those of shorter wave length than 0.39 micron, have no illuminating power. Certain varieties of them however are very active in destroying animal tissue. Complete data regarding them has not been obtained, but their harmful properties render it desirable to prevent any of these rays from entering the eye.

The retina or nerve surface of the eye can also be damaged by focussing excessive amounts of energy upon it. The selection of suitable glasses therefore involves two important features besides the provision of mechanical strength, viz. ultra-violet rays should be prevented from falling upon the eye, and the intrinsic brightness of the image thrown into the eye should be reduced to safe limits.

Very few glasses totally absorb the ulta-violet rays, and these are objectionable owing to the strong coloring in them. Yellow-green is the most desirable color.

Heat rays should be prevented from entering the eye because it is suspected that eye fatigue arises from the absorption of excessive heat. A desirable feature of the yellow-green glass is the fact that variations of brightness due to the changes in temperature of incandescent bodies have the same relative appearance to the eye when using this glass, as when using uncolored glass. This fact accounts for the satisfaction experienced by welders when judging temperatures through these glasses.

Common smoke glasses simply reduce the amount of light, but do not absorb the unsafe ultra-violet rays. A variety of glass known as Akopos has been found which absorbs all of these rays, and can be combined with other glasses which are necessary to reduce undue brightness.

The appended table gives designations of safe glasses for various metallurgical processes.

Process.	Temperature degrees Fahr.		Safe glasses
Electric arc	6,200		Ak. + E S
Electric arc under pressure	6,450		Ak E S
Oxy-hydrogen flame	3,600		Ak + S.16
Oxy-acetylene flame.	4,350		Ak + S.20
Thermit weld flame.	4,500		Ak + S.20
Metal at tuyeres, and furnaces	3,500		Ak + S 16
Metal at tuyeres, Blast furnaces	2,300	2,800	Ak S 12
Open hearth furnace flame	3,400	3,400	Cobalt Blue
Bessemer converter	3,400	3,600	Ak + S16
Open-hearth in ladle	2,800	2,900	Cobalt Blue
Bessemer ...	2,800	2,900	Ak + S 12
Soaking pits, low carbon	2,500	2,600	Ak + S 12
Soaking pits, high carbon	2,200		Ak. + S 12
Gasheating furnaces	2,400	2,800	Ak + S 12
Large gasheating furnace .	2,900	3,200	Ak + S 14

Ak. is an abbreviation for Akopos. E S, S 16, etc., are opticians' designations for glasses of various shades.

TAPER FUSE THREADS

FUSE adapter bushes of naval lyddite shells have a taper hole in them cut 14.083 threads per inch. In the 6-in. shell, the length of this thread is about 2 in., and it is quite impossible to get anything like a satisfactory job on so long a thread by using taps, as each of the cutting edges on the tap leaves a line where it stops cutting, and there is a danger of breaking the tap by running in too far.

For handling fuse adapter bushes on "Herbert" No. 4 capstan lathes, taper turning and chasing attachments, Fig. 1, are employed for cutting the thread. Previous to being chased, the hole is finished with taper reamers. The chasing attachment is shown in position in the illustration.

In action, the lathe spindle is run reversed and the chaser travels out from the work, operating in conjunction with the quick withdraw motion of the patent chasing saddle. The actual thread cutting is very rapid, taking approximately 40 seconds for a thread of 2 in. long, whilst the finish and accuracy obtained is excellent.

The corresponding male portion is screwed with a 1¼-in. "Coventry" patent self-opening diehead, fitted with the taper threading attachment shown in Fig. 2. The taper is governed by a former bar, which is forced outwards by a spring, and kept stationary by a stop held in the tool post of the lathe, while the diehead travels forward.

The advantage of cutting taper threads by this method is that the work is finished quite smooth and round, without the four ridges left by taper dies where they cease cutting. Herbert's Monthly.

As men improve in the service they render, their incomes should improve; they should be paid in proportion to the ability they show in the development of the business, whether it is an improvement in quantity or quality or both.

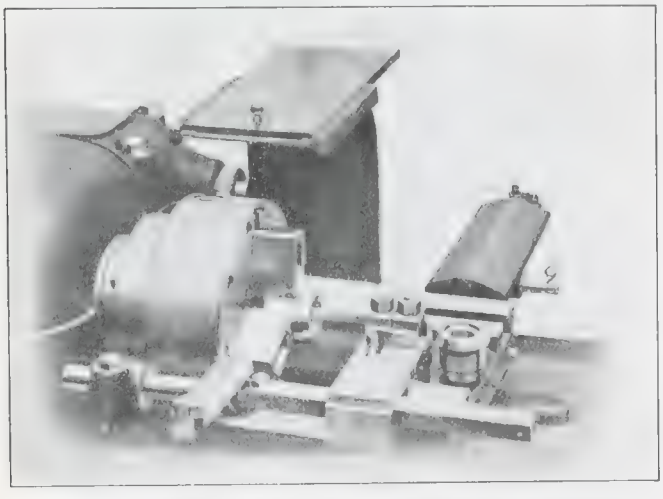


FIG. 1. TAPER TURNING AND CHASING ATTACHMENT

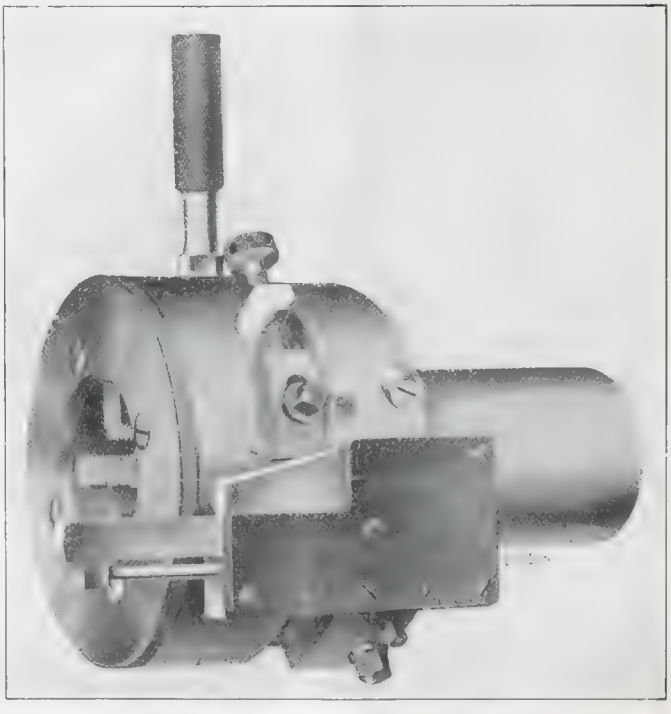


FIG. 2. "COVENTRY" PATENT SELF-OPENING DIEHEAD

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SCIENCE OR COMMON-SENSE?

THE beginning of the winter session of studies in the many technical schools throughout the country brings into prominence, every year, the subject of technical education. It is not very many years since discussions centered on the question, rather than the subject of technical education. People, especially employers, looked askance at the benefits which the rising generation of workers were supposed to be deriving from those institutions, and the practical value of the training, to the employer at any rate, was assessed at what, to the student, was a discouragingly low value.

will be largely dependent on the efficiency of the employees of the next generation.

By a peculiar coincidence, the recent meeting of the British Association for the Advancement of Science took place at Manchester almost simultaneously with the opening of the school in Toronto. As representing what might be turned the extremes of scientific knowledge the two events offer one of those contrasts which are characteristic of an age of advancement.

Knowledge feeds upon itself, and will not be suppressed. Ambition is the fruit of knowledge and a nation with no ambition is destined to ultimately sink into oblivion. Unguided ambition becomes recklessness, and when indulged in on a national scale induces catastrophe.

Professor Arthur Schuster, F.R.S., delivered his presidential address to the British Association on the subject of "The Common Aims of Science and Humanity." Although a man of German extraction, his deservedness of such a high honor was fully recognized by the authorities, and the subject matter of his address discloses a mind bereft of all traces of "kultur" and possessed of that receptive, analytical and constructive ability which is truly characteristic of the British scientist.

If it were possible to speak individually to the many thousands of young minds who at the present moment are digging into the rudiments of science with all the enthusiasm born of youth and novelty, advice for each one could be found in Dr. Schuster's Address.

In discussing the question of scientific success, he quotes a previous president who used these words regarding the qualifications necessary to make a man a great scientist: "But, I hear someone say, these qualities are not the particular attributes of the man of science, they may be recognized as belonging to almost everyone who has commanded or deserved success, whatever may have been his walk in life. That is so. That is exactly what I would desire to insist, that the men of science have no peculiar virtues, no special powers. They are ordinary men, their characters are common, even commonplace. Science, as Huxley said, is organized common-sense, and men of science are common men drilled in the ways of common-sense."

The student who wishes to attain success and all the happiness that accompanies the attainment of objects sought, will find his path smoothed, his interest sustained, and his accomplishments increased just so long as he remembers that his successes must be based on common-sense.

We commend a study of the Address to all thoughtful students at this time, and offer these few lines from it as representing sentiments which are worthy of assiduous cultivation:

. . . . "the object of science is to economize thought, just as it is the object of a machine to economize effort. Logically, this definition is justified, and it may be the best that can be given, if we prefer using a technical expression to confessing an emotional feeling. But why should we do so? Is it not better to recognize that human intelligence is affected by sentiment as much as by reasoning? It is a mistake for scientific men to dissociate themselves from the rest of humanity by placing their motives on a different, and at the best only superficially higher level."

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$14 70
Lake Superior, charcoal, Chicago	15 75
Ferro Nickel pig iron (Soo)	25 00

	Montreal.	Toronto.
Middlesboro, No. 3	22 00	.....
Carron, special	23 00	.....
Carron, soft	23 00	.....
Cleveland, No. 3	22 00	.....
Clarence, No. 3	22 50	.....
Glengarnock	26 00	.....
Summerlee, No. 1	28 00	.....
Summerlee, No. 3	27 00	.....
Michigan charcoal iron.	26 00	.....
Victoria, No. 1	23 00	20 50
Victoria, No. 2X	22 00	20 50
Victoria, No. 2 plain..	22 00	20 50
Hamilton, No. -	22 00	20 50
Hamilton, No. 2	22 00	20 50

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.20
Steel bars, f.o.b., Toronto	2.20
Common bar iron, f.o.b., Montreal	2.20
Steel bars, f.o.b., Montreal	2.20
Twisted reinforcing bars	2.20
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	1.30
Tank plates, Pittsburgh	1.30
Beams and angles, Pittsburgh	1.30
Steel hoops, Pittsburgh	1.50

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.10
Small shapes	2.35

Warehouse, Freight and Duty to Pay.	Cents.
Steel bars	1.90
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal.	Toronto.
Plates, ¼ to ½ in., 100 lb.	$2 35	$2 25
Heads, per 100 lb.	2 55	2 45
Tank plates, 3-16 in.	2 60	2 45

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$12 25	$12 50
Copper, crucible	14 25	14 00
Copper, unch-bled, heavy	14 25	14 00
Copper, wire, unch-bled.	14 25	14 25
No. 1 machine compos'n	11 50	11 50
No. 1 compos'n turnings.	9 00	9 00
No. 1 wrought iron	9 50	9 00
Heavy melting steel	8 00	8 00
No. 1 machin'y cast iron	13 50	11 00
New brass clippings	11 00	11 00
No. 1 brass turnings	9 00	9 00
Heavy lead	4 50	4 50
Tea lead	$ 3 25	$ 3 50
Scrap zinc	10 50	9 50

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Aug. 27, 1915:

	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
Standard				
¼, ⅜ in.	63	38½	....	....
½ in.	68	47½	....	....
¾ to 1½ in.	73	52½	....	....
2 in	73	52½	69	48½
2½ to 4 in	73	52½	72	51½
4½, 5, 6 in.	....	....	70	49½
7, 8, 10 in.	....	....	67	44½
X Strong P. E.				
¼, ⅜ in.	56	38½	....	....
½ in.	63	45½	....	....
¾ to 1½ in.	67	49½	....	....
2, 2½, 3 in.	68	50½	....	....
2 in.	....	....	63	45½
2½ to 4 in.	....	....	63	48½
4½, 5, 6 in.	....	....	66	48½
7, 8 in.	....	....	59	39½
XX Strong P. E.				
½ to 2 in.	44	26½	....	....
2½ to 6 in.	....	....	43	25½
7 to 8 in.	....	....	40	20½
Genuine Wrot Iron.				
⅜ in.	57	32½	....	....
½ in.	62	41½	....	....
¾ to 1½ in.	67	46½	....	....
2 in.	67	46½	63	42½
2½, 3 in.	67	46½	66	45½
3½, 4 in.	....	....	66	45½
4½, 5, 6 in.	....	....	63	42½
7, 8 in.	....	....	60	37½

Wrought Nipples.	
4 in. and under	77½%
4½ in. and larger	72½%
4 in. and under, running thread.	57½%
Standard Couplings.	
4 in. and under	60%
4½ in. and larger	40%

MILLED PRODUCTS.

Sq. & Hex. Head Cap Screws	65%
Sq. Head Set Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in. N.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake copper, carload	$20 00	$19 50
Electrolytic copper	20 00	19 25
Castings, copper	19 75	19 00
Tin	39 00	38 00
Spelter	18 00	18 00
Lead	6 15	6 25
Antimony	35 00	35 00
Aluminum	52 00	55 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer, billets, Pittsburgh	$24 50
Openhearth bilets, Pittsburgh	25 00
Forging billets, Pittsburgh	33 00
Wire rods, Pittsburgh	30 00

NAILS AND SPIKES.

Standard steel wire nails, base	$2 40	$2 35
Cut nails	2 50	2 70
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	2 85	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	75
Stove bolts	80
Plate washers	40
Machine bolts, ⅜ and less	70
Machine bolts, 7-16 and over	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes	4¼c per lb. off
Nuts, Hexagon, all sizes	4¾c per lb. off
Iron rivets	72½ per cent.
Boiler rivets, base, ¾-in. and larger	$3.75
Structural rivets, as above	3.75
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75 p.c. off
Wood screws, flathead, Bronze	70 p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong, Sizes Ins.	Price per ft.	D. Ex. Strong, Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	.....
7 in	2.38	7 in	3.81	....	.....
8 in	2.50	8 in	4.34	....	.....
8 in	2.88	9 in	4.90	....	.....
9 in	3.45	10 in	5.48	....	.....
10 in	3.20	....	....	....	.....
10 in	3.50	....	....	....	.....
10 in	4.12	....	....	....	.....

COKE AND COAL.

Solvay Foundry Coke	$5.75
Connellsville Foundry Coke	5.00
Yough. Steam. Lump Coal	3.83
Penn. Steam Lump Coal	3.63
Best Slack	2.99

Net ton f.o.b. Toronto

COLD DRAWN STEEL SHAFTING.

At mill	45%
At warehouse	40%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS.

Solder, half and half	0.22½
Putty, 100-lb. drums	2.70
Red dry lead, 100-lb. kegs, per cwt.	9.65
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.18
Benzine, single bbls., per gal.	0.18
Pure turpentine, single bbls.	0.64
Linseed oil, raw, single bbls.	0.72
Linseed oil, boiled, single bbls.	0.75
Plaster of Paris, per bbl.	2.50
Plumbers' Oakum, per 100 lbs.	4.00
Lead wool, per lb.	0.10
Pure Manila rope	0.16
Transmission rope, Manila	0.20
Drilling cables, Manila	0.17
Lard oil, per gal.	0.73
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHED DRILL ROD.

Discount off list. Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ inch	$8.00
5-16 inch	5.35
⅜ inch	4.60
7-16 inch	4.30
½ inch	4.05
9-16 inch	4.05
⅝ inch	3.90
¾ inch	3.85
⅞ inch	3.65
1 inch	3.45

Above quotations are per 100 lbs.

TWIST DRILLS.

	%
Carbon up to 1½ in.	60
Carbon over 1½ in.	25
High Speed	
Blacksmith	60
Bit Stock	60 and 5
Centre Drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS.

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 55 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 60 per cent.; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 75; malleable, tapped unions, 65.

TAPES.

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$2 70	$2 70
Canada plates, dull, 52 sheets	3 15	3 15
Canada Plates, all bright	4 75	4 75
Apollo brand, 10¾ oz. galvanized	6 40	5 95
Queen's Head, 28 B.W.G.	6 00	6 25
Fleur-de-Lis, 28 B. W. G.	5 75	5 75
Gorbal's Best, No. 28	6 00	6 00
Viking metal, No. 28	6 00	6 00
Colborne Crown, No. 28	5 38	5 30
Premier No. 28	5 60	5 50

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$11 00	.....
1¼ in.	11 00	.....
1½ in.	11 00	.....
1¾ in.	11 00	.....
2 in.	11 50	8 75
2¼ in.	13 00	10 50
2½ in.	14 00	11 15
3 in.	16 00	12 10
3½ in.	20 00	14 15
4 in.	25 50	18 00

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	0 11
X Grand	0 10½
XLCR	0 09¾
X Empire	0 09
X Press	0 08¼
COLORED	
Lion	0 07½
Standard	0 06¾
Popular	0 06
Keen	0 05¼
WOOL PACKING	
Arrow	0 16
Axle	0 11
Anvil	0 08
Anchor	0 07
WASHED WIPERS.	
Select White	0 08¾
Mixed Colored	0 06¼
Dark Colored	0 05¼

This list subject to trade discount for quantity.

BELTING RUBBER.

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED

Extra heavy, single hide belt	50%
Standard	50 & 10%
Cut Leather Belting, No. 1	$1.00
Lacings (2 sides)	1.10

ELECTRIC WELD COIL CHAIN P.B.

¼ in.	$6.00
5-16 in.	4.65
⅜ in.	4.00
7-16 in.	4.00
½ in.	4.00

Prices per 100 lbs.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper sulphate	.10
Cobalt Sulphate	.50
Iron, perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.17
Potassium carbonate	.40
Potassium sulphide	.30
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.22 to .25
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	1.50 to 1.75
Polishing wheels, bullneck	.80
Emery in kegs	.4½ to .06
Pumice, ground	.05
Emery glue	15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.05 to .07
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Que., October 4, 1915.—The news from the front is having a cheerful effect upon the general market. The production of shells is still holding the attention of a large number of our manufacturers, and is progressing at a satisfactory rate. The feeling of uncertainty of producing a shell that will stand a rigid inspection has now passed, and the output of 3.3 and 4.5 shells in both shrapnel and high explosive form has reached the stage, that no future shortage in this connection need be looked for. The attention of many of our shell makers is now directed to the prospects of a heavier type of projectile being required, and in some cases preparations are already in progress for the manufacture of shells up to nine and twelve inches in diameter.

The prospect of field guns being built by Canadian concerns in the near future, has developed several inquiries relative to machine tool requirements; no definite action has as yet been taken in the matter.

Steel.

The steel mills are operating practically to capacity on war stock, and orders are still coming in for rounds, in many cases up to 6 inches diameter. This condition of affairs is likely to be maintained for many months to come.

Pig Iron.

Pig iron is little changed from previous weeks, quotations are generally holding firm, prices on "Victoria" showing an advance of 50c per hundred.

Metals.

Little change is noted in metal quotations, the only metal affected being aluminum, which shows an increase from 50 to 52 cents. The market in tin is dull, a few inquiries being made for October and November delivery. There is, however, little to stimulate buying, and large unsold stocks have a tendency towards a somewhat pessimistic feeling.

Lead remains quiet, expectations of an advance have not been realized. Prices are holding firm.

Spelter remains steady with inquiries for future delivery a little more pronounced.

Antimony is quiet but firm, while aluminum shows a little stronger tone.

Machine Tools and Supplies.

Machine tools are still in strong demand, and with the prospect of the manufacture of larger and heavier type shells in the near future, the enterprise and capacity of the manufacturers is sure to be taxed to the utmost limit to procure reasonable delivery.

Machine shop supplies as may be expected are being used in larger quantities each succeeding week. Quotations on high speed steel are quite indefinite due to the fact that makers have withdrawn price lists, owing to the difficulty in securing the raw material.

Old Material.

The market in scrap metals is fairly brisk, crucible copper has advanced $1.00 per hundred, wire shows a slight increase, while No. 1 wrought iron and heavy melting steel show an advance of $1.00 per hundred. Heavy lead is up to $4.50.

Toronto, Ont., Oct. 5.—An encouraging feature to be noted is the continued increase in our export trade, although this has not as yet done much to improve domestic business. The improvement in the steel trade, referred to later in these columns, is a good indication of the development that is taking place. While the principal development has been in the export trade, it will obviously be of the greatest benefit to the country generally, and will in due course help to stimulate internal trade. There has been for some time, and there still is, a decided tendency to economize in all directions, and consequently development will be restricted until conditions are on a more stable basis, which can hardly be expected until the war is over.

It is, however, satisfactory to note that the Dominion revenues for September promise to be even greater than anticipated. In the Customs revenue alone there is an increase of over two million dollars for the month of September over the corresponding month last year, and an increase of about $1,750,000 for the first half of the present fiscal year. All indications point to a gradual improvement in domestic trade, due largely to war business of various kinds and, of course, to the excellent crops.

The output of shells is rapidly increasing. It is estimated that Canadian plants are producing one million shells per month, and that of this number 17,000 are being turned into fixed ammunition per day. It is announced that the Dominion Steel Corporation have practically completed arrangements for a large order for shell. The Canadian Car & Foundry Co. are making arrangements for sub-letting the last Russian shell contract to American and Canadian firms.

Steel Market

That the steel trade in Canada is now in a prosperous condition is proved by the reports of the Dominion Steel Corporation and the Nova Scotia Steel Co. issued recently. As regards the first mentioned concern, the indebtedness to the bank is being rapidly wiped out by means of profits made principally in export business. It is stated that heavy orders have been received for bars, billets, wire and nails, and that contracts for T.N.T. have proved exceptionally profitable. The coal trade has also been the best in the history of the company.

With regard to the Nova Scotia Steel & Coal Co., the annual statement was considered most satisfactory. The output of shells for September this year was the largest for any month since the manufacture of munitions began, being over 40 per cent. greater than for August. It was reported that the orders on hand would keep the plant at the present high rate of production for at least six months, and that negotiations for further orders were in progress. The Eastern Car Co., a subsidiary of the Nova Scotia Steel Co., is doing well. The first consignment of 250 fifty-ton box cars for the Russian Government has been shipped and will go via the Panama Canal and Vladivostock. The complete order calls for two thousand cars, all of the fifty-ton capacity. The Algoma Steel Co. has booked an order for 17,000 tons of steel rails from the Pere Marquette Railway.

The steel plants continue working to capacity on bars and forgings for shells, there being practically no limit to the demand. The merchant bar business has improved to some extent, but the demand for structural shapes is still very light. Prices on steel products generally are very firm and may go higher. The high-speed tool steel situation is unchanged, and prices will no doubt advance further. The most serious aspect of the situation, however, is the difficulty of obtaining supplies in sufficient quantity, as an enormous amount of high-speed steel is now being used. Prices of galvanized sheets are firmer and have a higher tendency, owing to the recent strength of spelter.

The steel trade in the States is very active, and the demand for steel products of all kinds is increasing. The mills are full up with business, and the export demand for steel rounds for shell, barb wire and other steel products is enormously heavy. There is a great scarcity of Bessemer and open-hearth billets, and prices are very firm, forging billets having advanced to $33 f.o.b. Pittsburgh. Steel hoops are now being quoted at 1.50c Pittsburgh. Prices on

bars, plates and shapes are very firm, with an upward tendency.

Pig Iron

The situation, generally speaking, is unchanged. There is a good demand for steel making pig iron, but foundries are quiet. It is reported that some pig iron is being exported to France. There are no price changes to note this week.

Scrap Metal

The scrap metal market is stronger, particularly for heavy melting steel, copper, brass and zinc scrap. Copper and brass scrap have advanced ½c to 1c per pound; zinc ½c per pound, and heavy melting steel $1 per ton. Wrought iron scrap is now being quoted at $9, and machinery cast iron at $11 per ton. Heavy lead is easier at 4½c per pound.

Machine Tools

The situation in the machine tool trade is practically the same as has prevailed for some weeks. Machine tool builders are working to capacity to fill orders on their books, but deliveries are still very backward. Comparatively few orders for new tools have been placed recently with local machinery houses, although a few of the larger firms making shells are buying single machines, in some cases second-hand tools. In the States there is a big demand for tools, and factory extensions are being held up owing to the difficulty in obtaining prompt delivery. In addition to the domestic demand, it is stated that English, French and Russian buyers are picking up all the machines they can find.

Supplies

The brisk demand for machine shop supplies continues, and prices are holding very firm. Prices of high-speed twist drills have practically been withdrawn, and are only being quoted subject to immediate acceptance. This is due, of course, to the scarcity and price of high-speed steel. Carbon drills have not as yet been affected, although there is a possibility of slightly higher prices being put in force.

Half-and-half solder has declined ½c and is now quoted at 23½c per pound. This is due to weakness in the tin market. Linseed oil has advanced 7c per gallon and is now quoted at 72c for raw and 75c for boiled oil. Turpentine is unchanged at 64c per gallon, but there is a possibility of higher prices.

Metals

The successful termination of the Anglo-French loan negotiations in New York and the rise in sterling exchange to a more normal basis is expected to have a beneficial effect on the metal market. There has been, however, up to the present, no marked improvement, and with the exception of tin and copper there have been no price changes of any particular importance. There has been increased activity in the copper market recently and prices are a little higher. Tin on the other hand has declined, due to weakness in the London market. The spelter situation is unchanged and the market steady. The lead market is firm and the price stationary. The antimony market is featureless, but there is a continued scarcity of aluminum, and quotations have a higher tendency. There is no change in the general situation locally and a brisk demand is reported for metals for munitions, ordinary business being only fair.

Tin.—The market is very dull and consumers are showing comparatively little interest in either spot tin or futures. An [illegible] sing the market. Tin has declined 1c locally and is being quoted at 38c per pound.

Copper.—The market is firm and higher, due to increased demand. It is believed that stocks are accumulating in the States notwithstanding the heavy consumption; production having reached a record mark. Copper has advanced [illegible] pound.

Spelter.—[illegible] prompt shipment. The London market is [illegible] quiet. Local quotations are unchanged at [illegible] per pound.

Lead.—The market is quiet and featureless. Quotations are unchanged at [illegible] per pound.

Antimony.—[illegible] little interest is being taken in antimony, as it is controlled by the Government. Local quotations are unchanged at [illegible] per pound.

Aluminum.—[illegible] are very difficult to obtain for immediate delivery, except in small lots. Quotations are unchanged and nominal at 55c per pound.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Messrs. S. Ruperti and Alexsieff, care Military Attache, Russian Embassy, Washington, D.C.

BIG HYDRO PLANS GO TO GOVERNMENT

PLANS [illegible] make the Hydro-Electric system of Ontario independent of all private developments and provide a supply sufficient not only for the next few years, but for many years to come, have been given final approval by the Hydro-Electric Commission and sent on to the Government.

As outlined by Sir Adam Beck at London several months ago upon the opening of the first Hydro radial in the province, the plans call for an initial development of 100,000 horse-power by utilizing the maximum head of power on the Niagara River, now undeveloped. The plants, it is understood, outline a possible supply from this source of 250,000 horse-power and cover as well developments possible from the utilization of the Welland Canal spillways, which will add as much more to the power supply of Ontario.

The construction of a great development plant in the Niagara district has become an urgent necessity by the rapid growth of the cheap power system in Ontario. Sir Adam Beck and his colleagues on the commission, Hon. I. B. [illegible] facing the end of their present sources of supply. The 100,000 horse-power supply contracted for with private interests at Niagara Falls will soon be exhausted by the increasing demands of the municipalities, which even the big [illegible] here and there in the province will not meet. With the advent of Hydro radials on an important scale, the present supply will fall far short, and when that time arrives the commission must be in a position to furnish practically unlimited power.

The commission has received word that the Council of Gravenhurst has passed a by-law approving of a contract with the commission for the sale of the South Falls power plant, owned by the town. This plant is now producing but 500 horse-power, but the commission's engineers have estimated that the output can be immediately enlarged to 1,500, with a maximum horse-power without storage of 2,500 and storage of 4,000. The surplus power will be used to supply municipalities in the surrounding district, which have been pressing the commission for power. The Gravenhurst by-law will be submitted to the rate payers on October 2.

THE CHEMICAL ENGINEER

IN the modern organization there is room for the research chemist of high and wide attainments, for the scientifically trained engineer, also of wide attainments, and for a type of professionally trained man who is the natural medium of interchange between these two specialists. This intermediary is the chemical engineer. He must be a man of special aptitudes, inasmuch as he must have grasped the chemist's point of view as well of the engineer's. The chemist thinks and works in terms of atoms and molecules and the laws which govern their combination. The engineer thinks of matter in masses which can be moulded to his will by the craftsman, or of mechanical or electrical energy which can be generated, controlled, and measured by machinery. The chemist is the master and director of his own operations, which he can, for the most part, carry out with his own hands. The engineer loses his direct hold on his operations whenever his ideas have been fully committed to paper in the drawing office. It is his special function to organize the labors of many workers. A certain number of men are able to enter fully into the spirit which actuates both types of expert, the chemist and the engineer; they can resist the particular exclusiveness of each, while giving to each its due weight. These are the naturally gifted chemical engineers who in one sense are "born, not made." In our colleges and universities the best that we can do for men of this gifted type is to give them the best possible opportunities for an all-round development of their powers. Dr. G. T. Bellby on "Chemical Engineering."

TO PREVENT accidents we must thoroughly understand their causes. Every danger point in every machine and in every process must be located and definitely grappled with. It is important to report accidents, but it takes less time to prevent them. Two minutes' work or care will often prevent an accident that would lose a man days from work.

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Comissioners and Commercial Agents should be kept supplied with catalogues, price lists discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

Argentine Republic.

H. R. Poussette, 278 Balcarce, Buenos Aires. Cable Address, Canadian.

Australasia.

D. H. Ross, Stock Exchange Building, Melbourne, Cable address, Canadian.

British West Indies.

E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.

J. W. Ross, 6 Kiukiang Road, Shanghai. Cable Address Cancoma.

Cuba.

Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

France.

Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona

Japan.

G. B. Johnson, P.O. Box 109, Yokohama. Cable Address, Canadian.

Holland.

J. T. Lithgow, Zuidblaak, 26, Rotterdam. Cable address, Watermill

Newfoundland.

W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

New Zealand.

W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

South Africa.

W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

United Kingdom.

E. de B. Arnaud, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

Acting Trade Commissioner, North British Building East Parade, Leeds. Cable address, Canadian.

F. A. C. Bickerdike, Canada Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

Fred. Dane, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

CANADIAN COMMERCIAL AGENTS.

British West Indies.

Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.

R. H. Curry, Nassau, Bahamas.

Colombia.

A. E. Beckwith, c-o Tracey Hmos, Medellin, Colombia. Cables to Marmato, Colombia. Cable address, Canadian.

Norway and Denmark.

C. E. Sontum, Grubbeged No. 4, Christiana, Norway. Cable address, Sontums.

South Africa.

D. M. McKibbin, Parker, Wood & Co., Buildings, P.O. Box 559, Johannesburg.

E. J. Wilkinson, Durban, 41 St. Andrew's Buildings, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE.

United Kingdom.

W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Montreal, Que.—It is reported that [illegible] of aeroplanes, etc.

Windsor, Ont.—[illegible] will make an extension to their factory at [illegible] Windsor, are the general contractors.

Walkerville, Ont.—The Canadian Detroit Lubricator Co. will make an extension to their factory. Wells & Gray, Windsor, Ont., are the general contractors.

Collingwood, Ont.—The Imperial Steel & Wire Co. will start operations at their plant early in October. Some delay has been experienced in connection with the contracts.

Gravenhurst, Ont.—The Muskoka Lakes Corporation is contemplating installing a number of small steam pumps at various points for fire protection. W. F. Wasley, of the Muskoka Navigation Co., is manager.

Fort William, Ont.—The Fort William Coal Docks Co., contemplate making an extension to their plant on the Mission River, estimated to cost $200,000. Included in the proposed addition will be a new hoist of a larger size than those now in use on the [illegible]

Toronto, Ont.—A [illegible] to provide a water supply for the southern portion of York Township was outlined in the report of Engineer Hugh Gall, submitted to the York Township Council at a special meeting held on September 30. The project as embodied in the report makes provision for all that district lying between the city limits and Eglinton Avenue, a distance of one and one-half miles. It is proposed to lay 12-in. and 6-in. cast iron pipe. The probable cost as estimated by the engineer is $750,000.

New Liskeard, Ont.—Another large pulp and paper mill is to be built in Timiskaming. Sutcliffe & Neelands, engineers, of Liskeard, have been advised to hold themselves in readiness to proceed with work discontinued when war broke out. The location of the proposed mill is some 30 miles west of Cochrane. Three miles of railway are necessary to connect with the Transcontinental Road. It is estimated $2,000,000 will be expended in the construction of this new pulp mill, and American capital is being [illegible]

Electrical

Chatsworth, Ont. [illegible] to raise $4000 for a [illegible]

London, Ont.—The City Council will purchase electrical equipment for the Hydro sub-station.

St. Marys, Ont.—Work is to commence on the new Hydro line from St. Marys to Exeter. The main power line will run from St. Marys to Exeter, passing through Wrotham [illegible]

Municipal

Walkerville, Ont.—The railway bylaw will be voted on by the ratepayers on October 16.

Dundas, Ont.—The town council passed a by-law to spend $25,000 on the extension of the waterworks system.

East Angus, Que.—It is proposed to spend $5,000 on extensions to the waterworks system.

Thetford Mines, Que.—A waterworks system will be installed at a cost of $12,000.

Blenheim, Ont.—The town council contemplate installing an ornamental lighting system.

Brigden, Ont.—The bylaw to authorize the extension to the lighting plant has been defeated.

Goderich, Ont.—The town council are considering the installing of an electric light and power plant.

East Angus, Que.—The town will make extensions to its waterworks plant to cost $5,000. R. C. Cowling is clerk.

St. Hyacinthe, Que.—A by-law has been carried providing for the installation of a complete gravity filter system, with a capacity of 4,000,000 gallons per day. Estimated cost, $75,000.

Woodstock, Ont.—The ratepayers are asking the council to compel the Woodstock Gas Light Co. to supply purified gas. It is suggested that purifiers be installed by the company.

Sarnia, Ont.—A by-law will be voted [illegible] by the city.

Montreal, Que.—The city has completed a modern street lighting system through the business portions of the [illegible] of the main retail thoroughfares. The turning on of the current for this system will give Montreal its first street [illegible]

Brockville, Ont.—The Water and [illegible] new tenders for the filtration plant, according to [illegible] tions prepared by the town engineer. One set of tenders have already been received but certain alterations have [illegible] ditions.

Port Moody, B.C.—If the electors of Port Moody endorse a bylaw to be voted upon on Oct. 7, the city will become the home of an extensive steel works and rolling mills to be erected there by the Port Moody Steel Works Ltd. The bylaw is one to authorize the city council to make an agreement with the company guaranteeing its debentures to the amount of $100,000.

Winnipeg, Man.—Seven tenders for electric mains, switchboards and circuit breakers for the power house at the new law courts, were opened by Hon. T. H. Johnson, minister of public works, on September 29. The tenders were as follows: The Schumacker, Gray Co., $6,950; Star Electric, $7,000; Electric Motor Sales & Repair Co., $7,985; Goold Engineering and Supply Co., $6,490; The Dominion Equipment and Supply Co., $6,880; Robert McCrea, $6,537.50; McDonald & Wilson Lighting Co., $7,077.

General Industrial

Montreal, Que.—Pilkington Bros. have [illegible] new factory.

Chatham, Ont.—The William Rennie Co., Toronto, are building a warehouse and elevator, estimated to cost $20,000.

Petrolia, Ont.—The [illegible] City Sugar Co. is contemplating establishing a plant, which will cost about $800,000. E. Hyatt, Petrolia, is a stockholder.

St. John, N.B.—Daley & Carvell have purchased a site of 20 acres at Washademoak, N.B., and will build a factory for the manufacture of axes, etc.

Hamilton, Ont.—The Mercury Mills Co. will build a factory here, to cost approximately $250,000. It is expected that construction work will begin shortly.

Medicine Hat, Alta.—W. E. Clarke proposes to establish a plant here for making clay products. A by-law will probably be voted on by the ratepayers on October 25, to ratify an agreement concluded by the City Council.

Ryerson, Sask.—The Saskatchewan Co-operative Elevator Co.'s elevator at this place was destroyed by fire on Sept. 21. The loss is estimated at $8,500, which is fully covered by insurance. The elevator will be rebuilt.

Winnipeg, Man.—Alfred W. Lawson, of New York City, a prominent manufacturer of aeroplanes, etc., has been in communication with Industrial Commissioner Roland with regard to establishing a factory here for making aeroplanes.

Tenders

Ottawa, Ont.—Tenders for examining warehouse fittings, Fort William, Ont., will be received until Thursday, October 14, 1915. Plans and specifications may be seen on application to J. C. Stinson, clerk of works, Fort William, Ont.; Thos. A. Hastings, clerks of works, Postal Station "F," Toronto, Ont., and at the Department of Public Works, Ottawa.

Ottawa, Ont.—Tenders for public building fittings, Three Rivers, P.Q., will be received until Wednesday, October 13, 1915. Plans and specification may be seen on application to Chas. Lafond, architect, Three Rivers, P.Q.; to R. L. Deschamps, overseer, Montreal Central Post Office, and at the Department of Public Works, Ottawa.

Ottawa, Ont.—Under the direction of the Honorable the Minister of Militia and Defence, certain old stores, consisting of leather, 2,700 lbs.; leather, buff, 335 lbs.; wrought iron, 4,200 lbs.; scrap steel, 116 lbs., and other stores, comprising canvas, rope, rubber, tarpaulins, mattresses, etc., are for sale by public tender until October 15. These stores may be seen on application to the senior ordnance officer, Old Fort, Toronto, daily, between the hours of 2 p.m. and 6 p.m., Saturdays and Sundays excepted. Eugene Fiset, Deputy Minister, Department of Militia and Defence, Ottawa.

Toronto, Ont.—Tenders will be received, addressed to the chairman, Board of Control, up to Tuesday, October 12, 1915, for the construction and delivery of 36-inch stop valves, valve operating mechanism and special castings, for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Ottawa, Ont.—Tenders will be received up to Tuesday, October the 19th, for the undermentioned items for delivery to H.M.C. Dockyards at Halifax, N.S., and Esquimalt, B.C.: Brass bars, antimony, iron firebar, brass sheets, aluminum, pig iron, brass tubes, steel angles, iron angles, copper sheet, steel boltstaves, iron boltstaves, copper tubes, steel plates, iron sheets, zinc plates, steel sheets, India rubber, lead, milled steel for tools, sheet packing, or sheet, etc. Forms of tender and all information may be obtained by application to the undersigned, or to the Naval Store Officer at H.M.C. Dockyard, Halifax, N.S., or Esquimalt, B.C. Applicants for forms are requested to state definitely the item or items on which they desire to tender. G. J. Desbarats, Deputy Minister of the Naval Service.

Building Notes

St. John, N.B.—It is reported that large extensions will be made to the warehouses at the Sand Point docks here.

Toronto, Ont.—The erection of fire stations at Earlscourt and Wychwood, is contemplated. Plans have been prepared and sites purchased.

Toronto, Ont.—The city architect has issued a building permit to the Board of Education for the erection of a three-storey brick addition, costing $51,500, to the North Toronto school on Eglington avenue, near Brownlow avenue.

Toronto, Ont.—The Toronto Furniture Co. have applied to the City Architect's Department for permission to build a $12,000 factory on Dufferin street near Liberty street. This will be used for the purpose of making boxes for the shipment of shrapnel shells.

Toronto, Ont.—The Board of Control has granted to the Dominion Government a permit for the erection of a temporary post office at the south-east corner of Front and Bay Streets. It will be 100 by 200 feet, clad with steel, two storeys high, with flat roof.

Preston, Ont.—The Hydro-Electric Commission has just completed arrangements for the erection of six transformer station storehouses in Guelph, Preston, Berlin, St. Mary's, Woodstock, and Cooksville. The buildings will be 36 by 60 feet, and will be of metal construction throughout.

Toronto, Ont.—The Board of Education proposes to build a large new school on Gledhill avenue, East Toronto, at a cost of $55,400. An application has been made for a permit for this work. The Architect's Department has issued a permit to the Board for the erection of a three-storey brick school on Eglington avenue, near Brownlow avenue. The structure will cost about $51,500.

New Incorporations

The France & Canada Steamship Co. has been incorporated at Ottawa, with a capital of $1,000,000, to operate a line of steamers between Canada and France. The head office will be in Montreal, Que.

The Standard Toys, Ltd. has been incorporated at Toronto, with a capital of $40,000, to carry on the business of manufacturing toys, etc., at Toronto. Incorporators, John Anthony Chantler and Ernest Walter Chantler, of Toronto.

The Franco-Canadian Chemical Co. has been incorporated at Toronto, with a capital of $1,000,000, to manufacture drugs and chemicals, at Toronto, Ont. Incorporators, Robt. Alexander Stephen and Adam McGowan Cook, of Toronto, Ont.

The Dominion Brake Shoe & Foundry Co. has been incorporated at Ottawa, with a capital of $200,000, to manufacture all kinds of brake shoes at St. Thomas, Ont. Incorporators, James Stellar Lovell and William Bain, of Toronto, Ont.

The Dome Consolidated Mines, Ltd. has been incorporated at Toronto, with a capital of $3,000,000 to acquire and develop mineral lands and deposits. The head office of the company will be at Toronto. Incorporators, Charles Henry Manaton and Arthur Hodgetts, of Toronto, Ont.

The Montreal Engine Packing Co. has been incorporated at Ottawa, with a capital of $20,000, to take over the business carried on under the name of Montreal Engine Packing Co. at Montreal. Incorporators, Edgar Alexander Wright and Gordon Balfour Kingan, of Montreal.

The Canadian Duplex Steam Trap Co. has been incorporated at Ottawa, with a capital of $40,000, to manufacture steam traps and other appliances, at Walkerville, Ont. Incorporators, Joseph Hector Mailhot and Thomas George Rakestraw, of Detroit, Mich., and Harry Owens Kerr, of Walkerville, Ont.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

The Chevrolet Motor Co. of Canada, Ltd. has been incorporated at Ottawa, with a capital of $500,000, to manufacture automobiles, etc., at Toronto. Incorporators, Harry Horsman, George Edmund Wooldridge, both of Toronto, Ont.

Wood-Working

Montreal, Que.—A fire on September 28 did about $15,000 damage to the G. H. Randall Co. furniture factory.

Montreal, Que.—The sash and door factory of Benoit Sons, on St. Timothe Street, was destroyed by fire on Sept. 25.

Cache Bay, Ont.—Geo. Gordon & Co. are building a new mill, and will require woodworking machinery .

Cache Bay, Ont.—George Gordon & Co., Ltd., will rebuild its sawmill, recently destroyed by fire, at a cost of $75,000. Alexander Trottier is in charge.

Vancouver. The sawmill and buildings of the British Canadian Lumber Co., at New Westminster, have been sold for $1,000,000 to Leonard Imboden.

Fredericton, N.B.—Donald Fraser & Sons, of this place, have purchased a property at Nelson, on the Miramichi, and will build a lumber mill at a cost of $80,000.

Bancroft, Ont.—There is a probability of a new industry being established here to make broom handles, spools, etc. G. A. Turner and Wm. Paul, of Toronto, are interested.

Refrigeration

Hamilton, Ont.—A scheme providing for the establishment of a cold storage system in connection with the central market meat hall is being seriously considered by some of the aldermen.

Marine

Bathurst, N.B.—It is announced that arrangements are being made for the completion of the harbor development work here.

Ottawa, Ont.—The Government steamer Montmagny, which was rammed and sunk by the collier Lingan in the St. Lawrence over a year ago, is to be raised. The steamer now lies in ten fathoms of water off Grosse Isle. The contract for raising her has been awarded to the Levis Wrecking Company at $27,000.

Canadian Coasting Laws.—The Lake Carriers' Association, of Cleveland, Ohio, has been officially notified that the Canadian coasting laws have been suspended and American ships will be permitted to trade between Canadian lake ports during the remainder of the season. During the navigation season of 1914 there were 105 vessels of Canadian registry employed in the grain carrying trade on the Great Lakes, their total tonnage being 350,000. Owing to the transfer of many of these ships to the ocean trade, there are available this season only 56 Canadian ships, with combined tonnage of 109,000.

Personal

W. F. Hume, late manager of the Dominion Architectural Ironworks, Montreal, has been appointed shop superintendent of the Quebec Engineering Co., Quebec.

A. B. Smith, manager of the G. T. R. telegraphs, has resigned on account of ill-health. H. Hulatt has been appointed his successor, with headquarters in Montreal.

Captain Henry I. Matthews, who died last week at Lakeport, Ont., was the founder of the Lakeport Canning Factory, which was one of the constituent plants of the Canadian Canners, Ltd. Until the latter organization was absorbed by the Dominion Canners. Captain Matthews was one of its directors.

Trade Gossip

The Kelsey Wheel Co., Windsor, Ont., have increased their capital stock to $250,000.

The Canadian Westinghouse Co., Hamilton, Ont., have been awarded a contract by the City of Ottawa, Ont., for switchboard and equipment, and also transformers, at a total cost of $23,165

The Monarch Engineering Co., has been licensed to carry on business in the Province of Ontario, with a capital not exceeding $40,000. Alex. Fraser, of Niagara Falls, Ont., is the attorney.

Large Munition Contract.—The officials of the Dominion Steel Corporation were in Ottawa last week working on an unusually large munition contract. No definite announcement has yet been made, but it is understood that arrangements are practically completed for the work to go ahead.

Spanish River Pulp & Paper Mills.—The annual meeting of shareholders was held on October 1, at which the report for the year ending June 30, 1915, was approved. The following were elected to the board of directors: W. E. Stavert, P. B. Wilson, T. Watson Sime, C. E. Read, B. J. Tooke, G. H. Mead and T. Gibson. The same board was elected by the Lake Superior Paper Co.

Canada Steamship Lines.—Five vessels of the Canada Steamships Lines fleet, now engaged in lake trade, are being reconstructed, and will be placed at the disposal of Canadian grain exporters for ocean service. This is the first step taken by the commission at Ottawa, of which Hon. Robert Rogers is president, to relieve the scarcity of tonnage, which is hampering Canadian export trade.

Dominion Steel Foundry Co.—An addition, 100 x 160 feet, to the main foundry building of the Dominion Steel Foundry Co., Hamilton, Ont., is nearing completion. The company has installed in this addition one 25-ton acid open-hearth furnace and one 30-ton Shaw electric 4-motor crane. The company has also installed a complete outfit for machining 3-inch British shrapnel shells and machinery for finishing 4.5 howitzer shells.

The Eastern Car Co., New Glasgow, N.S., subsidiary of Nova Scotia Steel & Coal, has shipped the first consignment of the two-thousand-car order placed by the Russian government. The shipment, consisting of 250 complete cars, was made in one of the vessels controlled by the parent company, and will travel to its destination via the Panama Canal. It is estimated that orders from the Russian and French governments will require fifteen steamers to transport. The company has increased its output during the past few weeks from 20 to 40 complete cars.

Ambulances Gift.—Noel Marshall accepted a motor ambulance on behalf of the Red Cross Society on September 30 from the employees of the McLaughlin Carriage Co., at the warerooms of the company in Toronto. Mrs. Ward, president of the Toronto District W.C.T.U., also presented a motor ambulance to the Red Cross Society through Mr. Marshall later in the afternoon at Willard Hall, Gerrard Street. Both these machines were the product of the McLaughlin Carriage Co., and will be sent to the front.

Inquiry for Grain Elevator Equipment.—A number of elevators for storage of grain are likely to be constructed in the near future by a foreign government these varying in capacity from 250,000 to 1,250,000 bushels. Such work has been supplied in the past from Germany but as further supplies are not obtainable from that country the government in question desires to be informed from Canadian sources the cost of elevators both in construction and in re-

gard to machinery and equipment. Information can be obtained by reference to the Department of Trade and Commerce, Ottawa (File A-1575).

The Turbine Equipment Co., Toronto, have recently secured the following contracts:—Canadian Copper Co., Copper Cliff, Ont., two 7½ million-gallon a day De Laval centrifugal pumps, direct connected to Canadian Westinghouse motors; Pilkington Bros., Thorold, Ont., one De Laval 3-stage pump, direct connected to Canadian Crocker Wheeler motor; Samuel Austin & Co., Thorold, Ont., one De Laval single-stage pump, direct connected to Canadian Crocker Wheeler motor; Kerr Lake Mining Co., Cobalt, Ont., one De Laval 3-stage pump, direct connected to Canadian Westinghouse Co. motor.

Soo Canal Traffic—Eastbound traffic through the St. Mary's Falls Canals, Sault Ste. Marie, Ont., shows a large increase over September of last year, according to the monthly statistical report compiled by the engineer's office. Last year, 6,368,408 tons were locked through eastbound, while during September, 1915, 907,771 tons passed the Soo. The increase is shown in the entire list of commodities except flour, iron ore leading, of which 7,796,965 tons were carried through, or 2,509,808 tons more than September, 1914. Copper also shows a heavy increase, being 9,160 tons over last year. The amount of grain and wheat locked for lower lakes elevators was 31,927,870 bushels, against 27,579,621 for September, 1914, or an increase of 4,668,249. The passenger list eastbound during September this year was nil. Westbound traffic shows a decrease. The total freight, however, showed a net increase of 2,561,735 tons, 445 more passages being registered for the month over last year.

Catalogues

Trucks.—The "Lifton" truck for handling goods piled on platforms is described in a bulletin issued by the W. S. Mahaffy Co., Toronto. The truck is illustrated, and the essential particulars are given.

Reducing Valves, made by the James Morrison Brass Mfg. Co., Toronto. The J.M.T. standard reducing valve is fully described in this bulletin, which also includes directions for installing, cleaning and method of operation. The bulletin is illustrated.

"**Foundry Filosofy**" is the title of a booklet published by the Hill & Griffith Co., Cincinnati, Ohio, manufacturers of foundry facings, supplies and equipment. The booklet is a combination of

[illegible] a list of users is also included.

Edison Mazda "C" Lamps [illegible] letin No. 43603A, issued by the Can- [illegible] Mazda lamp and the wide field of application is dealt with. In the latter con- [illegible] a variety of installations in addition to [illegible] tures. Tables are included giving date [illegible]

Steam Specialties and Mill Supplies.—[illegible] with an interesting line of flexible metallic hose, steam traps, packings, miscellaneous steam goods, tools, mill supplies, etc. The various products are illustrated and described, while complete price lists are included. This is a [illegible] pages, with index, and will be found [illegible] have on hand for reference.

TORONTO HYDRO-ELECTRIC REPORT

NET earnings of $303,686 for the first half of this year were recently reported by the Toronto Hydro-Electric system. The money was spent as follows: Interest, $130,948; interest on past instal- [illegible] accrued, $46,635; balance for depreciation and annual adjustments, $121,100.

The income of the concern for the first six months totalled $770,553, made up as [illegible] commercial light, $174,662.51; municipal building light, $9,878; municipal power earnings, $80,287.84; municipal street lighting earnings, $170,916.20; rent of meters, $805.24; stores charges, $21,122.57; system consumption, $3,279.02; miscellaneous general expenses, contract account, $2,815.17; other municipalities, $1,700.39; non-operating income, $9,378.53. The cost of electric current was $184,835.63, and the expenses of operation, etc., $228,031.60.

The assets of the system are placed at $7,596,947.78, and the liabilities amount to $121,109 less.

General Manager Couzens declares that in spite of the war business has increased, that the unit cost of operation has decreased over 10 per cent., that the Hydro in the period mentioned benefited to the extent of $94,000, that the amount of power purchased from the Provincial Commission was $185,000, as compared with $147,000 in the same period last year, and that the system has not yet received from the city the proceeds of the debentures sold some months ago, and the amount due in respect of the loss on the bonds last year, amounting altogether to $1,350,000. The city, however, has a contra account for about a million dollars for interest and sinking fund.

AUSTRALIAN TRADE AND THE WAR

A COMPARISON of the manner in which Australian and Canadian trade have been affected by the war, and an official statement as to the number of soldiers Britain's Antipodean colony has contributed to the allied cause is contained in a report to the Canadian Government by Trade Commissioner Ross in Melbourne.

Australian trade during 1913-14 totalled $812,812,658, as compared with a Canadian total of $1,113,562,107. In 1914 her trade was but $608,652,014, as compared with Canada's showing of $1,078,173,240.

Since the declaration of war on August 4, 1914, the Commonwealth had organized, equipped and despatched 76,566 troops for active service abroad. At the present time 40,400 troops are in camps in Australia for despatch to the front. The Government has announced its determination to continue to train, equip and transport to the seat of war every available man presenting himself for service and who succeeds in passing the necessary medical examination.

To date, the grand total of the Australian expeditionary forces raised has reached 117,000 men, excluding 8,000 troops of the citizen forces mobilized for home defence. Reinforcements are going forward at the rate of 5,300 a month, and this number will be increased The various divisions comprise infantry, to 10,600 in October and in November. light horse, ammunition columns, artillery, engineers, army service corps, army medical corps, flying corps, veterinary sections, bridging train and pay corps.

At the request of the Government of India a section of the Australian flying corps was despatched to the Persian Gulf, and is working in conjunction with the Royal Flying Corps. Further reinforcements are to be sent.

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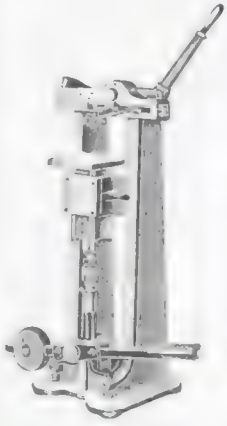

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Can. H. W. Johns-Manville Co., Limited, Toronto.
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West Tire Setter Co., Rochester, N.Y.

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Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

Bars, Boring.
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Owen Sound Iron Works Co., Owen Sound.

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Bar Benders, Hydraulic.
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Graton & Knight Mfg. Co., Montreal.

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Graton & Knight Mfg. Co., Montreal.

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Graton & Knight Mfg. Co., Montreal.
Jones & Glaseo, Montreal
Morse Chain Co., Ithaca, N.Y.

Belting, Cotton.
Dominion Belting Co., Hamilton.

Belting, Leather.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Graton & Knight Mfg. Co., Montreal.
Main Belting Co., Montreal.
Morse Chain Co., Ithaca, N.Y.

Belting, Stitched Cotton Duck.
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Tallman Brass & Metal Co., Hamilton

Castings, Air Furnaces.
Wm. Tod Company, Youngstown, O.

Castings, Brass.
Cunningham & Son, St. Catharines, Ont.
Alexander Fleck, Ltd., Ottawa.
T. C. Lawrence Foundry, Galt, Ont.
Mesta Machine Co., Pittsburg, Pa.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Tallman Brass & Metal Co., Hamilton
Wm. Tod Company, Youngstown, O.

Castings, Bronze.
Cunningham & Son, St. Catharines, Ont.
Mesta Machine Co., Pittsburg, Pa.
Tallman Brass & Metal Co., Hamilton
Wm. Tod Company, Youngstown, O.

Castings, Copper.
Cunningham & Son, St. Catharines, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Gray Iron.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Erie Foundry Co., Erie, Pa.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Mesta Machine Co., Pittsburg, Pa.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Wm. Tod Company, Youngstown, O.

Castings, Steel Chrome and Manganese Steel.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Company, Youngstown, O.

Castings, Malleable.
Galt Malleable Iron Co., Galt.

Castings, Nickel Steel.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
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Gardner Machine Co., Beloit, Wis.

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Can. H. W. Johns-Manville Co., Limited, Toronto.
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Gardner, Robt., & Son, Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound.

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Pratt & Whitney Co., Dundas, Ont.
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National Machinery & Supply Co., Hamilton.

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Jones & Glassco, Montreal.
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Chucks, Aero, Automatic.
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Girard Machine & Tool Co., Philadelphia, Pa.
Wells Brothers Co., Greenfield, Mass.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
National Machinery & Supply Co., Hamilton.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Chucks, Drill, Automatic and Keyless.
Buffalo Forge Co., Buffalo, N.Y.

Chucks, Ring Wheel.
Gardner Machine Co., Beloit, Wis.

Chucking Machines.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Turner Machine Co., Danbury, Conn.
Warner & Swasey Co., Cleveland, O.

Clocks, Time and Watchman's.
Lintz Porter Co., Toronto.

Cloth and Wool Dryers.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Sheldons, Limited, Galt.

Clutches.
Eastern Machinery Co., New Haven, Conn.
Jones & Glassco, Montreal.
Owen Sound Iron Works Co., Owen Sound.
Positive Clutch & Pulley Works, Ltd., Toronto.

Coal Handling Machinery.
Whiting Foundry Equipment Co., Harvey, Ill.

Coke and Coal.
Hanna & Co., M. A., Cleveland, O.

Collectors, Pneumatic.
Can. Buffalo Forge Co., Montreal.
Sheldons, Limited, Galt.

Compressors, Air.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.
Mesta Machine Co., Pittsburg, Pa.
National Machinery & Supply Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton.

Concentrating Plant.
Gardner, Robt., & Son, Montreal.

Concrete Mixers.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton.

Concrete Reinforcement.
Canada Wire Goods Mfg. Co., Hamilton.

Condensers.
Can. Buffalo Forge Co., Montreal.
Mesta Machine Co., Pittsburg, Pa.
The Smart-Turner Machine Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Company, Youngstown, O.

Contracting Engineers, Electrical
Lintz-Porter Co., Toronto.

Controllers and Starters, Electric Motor.
A. R. Williams Machy. Co., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Conveyor Machinery.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.

Coping Machines.
Can. Buffalo Forge Co., Montreal.
John Bertram & Sons Co., Dundas.
National Machinery & Supply Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Cornice Brakes.
Brown Boggs Co., Ltd., Hamilton, Canada.
Steel Bending Brake Wks., Chatham.

Counting Machines.
National Scale Co., Chicopee Falls, Mass.
C. J. Root Co., Bristol, Conn.

Counterbores and Countersinks.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Countershafts.
Baird Machine Co., Bridgeport, Conn.
Wells Bros. Co., Greenfield, Mass.

Country House Lighting and Cooking.
Can. Blaugas Co., Montreal.

Couplings.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Eastern Machinery Co., New Haven, Conn.
Gardner, Robt., & Son, Montreal.
Owen Sound Iron Works Co., Owen Sound, Ont.

Couplings, Air Hose.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Crabs, Travelling.
Owen Sound Iron Works Co., Owen Sound.

Cranes, Locomotive.
Northern Crane Works, Walkerville.

Cranes, Gantry.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Goliath.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.
Watson-Stillman Co., Aldene, N.J.

Cranes, Pneumatic.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Post Jib.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Portable.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Swing Jib.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Transfer.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Wall.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Travelling Electric and Hand Power.
Dominion Bridge Co., Montreal.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Crane, Chain.
Northern Crane Works, Walkerville.

Cranes, All Kinds.
Northern Crane Works, Walkerville.
Owen Sound Iron Works Co., Owen Sound, Ont.
Southwork Foundry & Machine Co., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine.
Niles-Bement-Pond Co., New York.

Crimps, Leather.
Graton & Knight Mfg. Co., Montreal.

Cupolas.
Can. Buffalo Forge Co., Montreal.
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola and Blast Gate Blowers.
Can. Sirocco Co., Ltd., Windsor, Ont.

Cupola Blast Gauges & Blowers.
Sheldons, Ltd., Galt, Ont.

Cutters, Angle, Tee Iron and Bar.
Can. Buffalo Forge Co., Montreal.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Cutters, Pipe.
Can. Fairbanks-Morse Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Trimont Mfg. Co., Roxbury, Mass.

Cutting Compound & Cutting Oil.
Can. Economic Lubricant Co., Montreal.
Can. Oil Companies, Toronto.
Cataract Refining Co., Buffalo, N.Y.
Crescent Oil Co., New York.
Racine Tool & Machine Co., Racine, Wis.

Cutter Grinders and Attachments
Cincinnati Milling Machine Co., Cincinnati.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.

Cutters, Milling.
A. R. Williams Machy. Co., Toronto
Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Morse Twist Drill and Machine Co., New Bedford.
Tabor Mfg. Co., Philadelphia, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Cutting-off Machines.
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Geo. Gorton Machine Co., Racine, Wis.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
John H. Hall & Sons, Brantford, Ont.
Nutter & Barnes Co., Hinsdale, N.H.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Can. Fairbanks-Morse Co., Montreal.

Derricks.
Dominion Bridge Co., Montreal.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Designers, Special Machinery.
Baird Machine Co., Bridgeport, Conn.

Dies and Die Stocks.
Armstrong Mfg. Co., Bridgeport, Conn.
Banfield, W. H. & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs & Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Duncan Electrical Co., Montreal.
Gardner, Robt., & Son, Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wiley & Russell, Greenfield, Mass.

Dies for Bit Brace Use.
Wells Brothers Co., Greenfield, Mass.

Die Sinkers.
Garvin Machine Co., New York.

Dies for Machines.
Wells Brothers Co., Greenfield, Mass.

Die Sinking Presses, Hydraulic.
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Dies, Self-opening.
Duncan Electrical Co., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit

If what you want is not advertised in this issue consult the Buyers' Directory at the back

Dies, Opening.
W. H. Banfield & Sons, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Duncan Electrical Co., Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.

Dies for Screw Plates.
Wells Brothers Co., Greenfield, Mass.

Dies, Sheet Metal Working.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

Dies, Screws and Thread.
Armstrong Mfg. Co., Bridgeport, Conn.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.

Discs, Leather.
Graton & Knight Mfg. Co., Montreal.

Draughtsman's Tools.
Emmert Mfg. Co., Waynesboro, Pa.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Windsor, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Limited, Galt, Ont.

Drift Bolt Cutters.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drill Presses.
Baker Bros., Toledo, O.
W. F. & John Barnes Co., Rockford.
Can. Buffalo Forge Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
A. R. Williams Machinery Co., Toronto.

Drilling Machines, Locomotive and Multiple Spindle
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Garlock Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.

Drilling Machines, Radial and Turret.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Sensitive.
Baker Bros., Toledo, O.
W. F. & John Barnes Co., Rockford.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Rockford Machine Tool Co., Rockford.

Drilling Machines, Upright and Horizontal.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Colburn Mach. Tool Co., Franklin, Pa.
A. R. Williams Machy. Co., Toronto.
W. F. & John Barnes Co., Rockford.
John Bertram & Sons Co., Dundas.
Garlock Machinery, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Rockford Machine Tool Co., Rockford.
R. McDougall Co., Galt.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.

Drilling Posts.
Keystone Mfg. Co., Buffalo, N.Y.

Drills, Bench.
W. F. & John Barnes Co., Rockford.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

Drills, Blacksmith and Bit Stock.
Can. Buffalo Forge Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills, Centre.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co. New Bedford.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills Corner (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drills, Electric and Portable.
A. R. Williams Machy. Co., Toronto.
Can. Buffalo Forge Co., Montreal.
Niles-Bement-Pond Co., New York.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

Drills, High Speed.
Baker Bros., Toledo, O.
Cleveland Twist Drill Co., Cleveland.
Can. Fairbanks-Morse Co., Montreal.
Morse Twist Drill and Machine Co., New Bedford.
W. F. & John Barnes Co., Rockford, Ill.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills, Multiple Spindle.
Pratt & Whitney Co., Dundas, Ont.
Niles-Bement-Pond Co., New York.

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co. New Bedford.

Drills, Pneumatic.
John F. Allen Co., New York.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.

Drills, Ratchet and Hand.
Armstrong Bros. Tool Co., Chicago.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drills, Rock.
A. R. Williams Machy. Co., Toronto.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drills, Track.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drills, Twist.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
John Morrow Screw Co., Ingersoll, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drill Holders.
Wells Brothers Co., Greenfield, Mass.

Drill Sockets.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drying Appliances.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.

Drying Out Barrels.
Baird Machine Co., Bridgeport, Conn.

Drying Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Dump Cars.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.

Dust Separators.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Dust Arresters (for Tumbling Mills).
Whiting Foundry Equipment Co., Harvey, Ill.

Dynamos and Electrical Supplies.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Electrical Supplies.
Duncan Electrical Co., Montreal.
Lintz-Porter Co., Toronto.

Elevator Enclosures.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Elevating and Conveying Machinery.
Can. Mathews Gravity Co., Toronto.
Plessisville Foundry, Plessisville, Que.

Emery Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

Emery and Emery Wheels.
Can. Fairbanks-Morse Co., Montreal.
Canadian Hart Wheels, Hamilton, Ont.
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

Emery Wheels, Dressers and Stands.
Canadian Hart Wheels, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
National Machinery & Supply Co. Hamilton, Ont.
Norton Co., Worcester, Mass.

Emery Wheel Safety Flanges.
Canadian Hart Wheels, Hamilton, Ont.

Enameling Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Engines, Corliss, Compound, Pumping.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Company, Youngstown, O.

Engines, Gas and Gasoline.
Can. Fairbanks-Morse Co., Montreal.
Jones & Glassco, Montreal.
Mesta Machine Co., Pittsburg, Pa.
National Machinery & Supply Co., Hamilton.
Wm. Tod Company, Youngstown, O.

Engines, Horizontal and Vertical.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Mesta Machine Co., Pittsburg, Pa.
A. R. Williams Machy. Co., Toronto.
Sheldons, Ltd., Galt, Ont.
Wm. Tod Co., Youngstown, O.

Engines, High-Speed, Automatic.
Can. Buffalo Forge Co., Montreal.

Engines, Steam.
Can. Buffalo Forge Co., Montreal.
Mesta Machine Co., Pittsburg, Pa.
Plessisville Foundry, Plessisville, Que.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Company, Youngstown, O.

Engines, Stationary and Marine.
Southwark Foundry & Machine Co., Philadelphia, Pa.

Engineering Books.
The MacLean Publishing Co., Ltd., Toronto.

Engraving Machines.
Geo. Gorton Machine Co., Racine, Wis.

Elevators and Buckets.
Eastern Machinery Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Equipment Shop.
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Wm. Tod Co., Youngstown, O.

Escutcheon Pins.
Parmenter & Bulloch Co., Gananoque.

Evaporators' Machinery.
Brown, Boggs & Co., Hamilton, Can.

Exhaust Heads and Hoods.
Can. Buffalo Forge Co., Montreal.
Can. Steel Products Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Exhausters.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.

Experimental Machinery.
Owen Sound Iron Works Co., Owen Sound.

Extractors, Ingot.
Mesta Machine Co., Pittsburg, Pa.

Fans.
Can. Buffalo Forge Co., Berlin, Ont.
Baird Machine Co., Bridgeport, Conn.
Can. Sirocco Co., Ltd., Windsor, Ont.
Lintz-Porter Co., Toronto.
Plessisville Foundry, Plessisville, Que.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

Feed Water Heaters.
Can. Fairbanks-Morse Co., Montreal.
The Smart-Turner Machine Co., Hamilton.

Fence, Iron Factory.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.
Standard Tube & Fence Co., Woodstock, Ont.

Files.
Delta File Works, Philadelphia, Pa.
Nicholson File Co., Port Hope, Ont.

Fire Alarm Apparatus.
Lintz-Porter Co., Toronto.

Fire Extinguishers.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Fire Escapes.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Flash Lamps.
Lintz-Porter Co., Toronto.

Flexible Shafts.
Chicago Flexible Shaft Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.

Flumes.
Toronto Iron Works, Ltd., Toronto.

Forges, Hand, etc.
Can. Buffalo Forge Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
National Machinery & Supply Co., Hamilton.
Sheldons, Limited, Galt, Ont.

Forgings, Drop, Automobile and Locomotive.
Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.
Mesta Machine Co., Pittsburg, Pa.
J. H. Williams Co., Brooklyn, N.Y.

Forging Hammers, Belt-Driven.
Bliss, E. W., Co., Brooklyn, N.Y.
Plessisville Foundry, Plessisville, Que.

Forging Hammers, Steam.
Erie Foundry Co., Erie, Pa.

Forging Machinery.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
National Machinery Co., Tiffin, Ohio.
Plessisville Foundry, Plessisville, Que.
Wm. Tod Company, Youngstown, O.
Watson-Stillman Co., Aldene, N.J.

Foundry Equipment.
Northern Crane Works, Walkerville.
W. W. Sly Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Friction Leathers.
Graton & Knight Mfg. Co., Montreal.

Friction Clutch Pulleys, etc.
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Eastern Machinery Co., New Haven, Conn.
Owen Sound Iron Works Co., Owen Sound.
Positive Clutch & Pulley Works, Toronto.

Furnace Engineers and Contractors.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Blast.
Toronto Iron Works, Ltd., Toronto.

Furnaces, Oil, Coal, Gas and Electric.
Canadian Hoskins, Limited, Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Steel Heating and Brass Melting.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Heat Treating, Hardening and Tempering.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Forging.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Annealing, etc.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces for Baking, Bluing, Drying, Enameling, Japanning and Lacquering.
Oven Equipment & Mfg. Co., New Haven, Conn.

Furnace Lining.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Fuse Cap Machinery.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Gang Planer Tools.
Armstrong Bros. Tool Co., Chicago.

Gaskets, Leather, etc.
Graton & Knight Mfg. Co., Montreal.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Gas Blowers and Exhausters.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Limited, Galt.
Southwark Foundry & Machine Co., Philadelphia, Pa.

Gas Burners.
Oven Equipment & Mfg. Co., New Haven, Conn.

Gas Machines.
Brown, Boggs & Co., Hamilton, Can.

Gas Producer Plants.
Can. Fairbanks-Morse Co., Montreal.

Gauges, Hydraulic Pressure.
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Gauges, Standard.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Holden-Morgan Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn.
Garvin Machine Co., New York.
National Machinery & Supply Co., Hamilton.

Gear-Cutting Machinery.
Girard Machine & Tool Co., Philadelphia, Pa.
Hamilton Gear & Machine Co., Toronto.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Sheldons, Limited, Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Wm. Tod Co., Youngstown, O.
D. E. Whiton Machine Co., New London, Conn.

Gears, Cut, Mortise, Angle, Worm.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Jones & Glasseo, Montreal, P.Q.
Mesta Machine Co., Pittsburg, Pa.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.
Wm. Tod Co., Youngstown, O.

Gears, Rawhide.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Jones & Glasseo, Montreal, P.Q.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

Generators, Electric.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
Toronto and Hamilton Electric Co., Hamilton.

Grain for Polishing.
Norton Co., Worcester, Mass.

Graphite.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Jos. Dixon Crucible Co., Jersey City.
Stevens, F. B., Detroit, Mich.

Grinders, Automatic Knife.
W. H. Banfield & Son, Toronto.

Grinders, Centre, Pedestal and Bench.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Ford-Smith Machine Co., Hamilton.
Foss & Hill Machy. Co., Montreal.
Gray Mfg. & Machine Co., Toronto.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
New Britain Machine Co., New Britain, Conn.
Norton Grinding Co., Worcester, Mass.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

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United States Electric Tool Co., Cincinnati, O.

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Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
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Modern Tool Co., Erie, Pa.
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Motch & Merryweather Machy. Co., Cleveland, O.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Machine Co., Greenfield, Mass.
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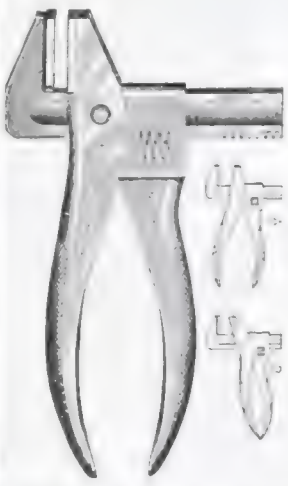

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Canadian Billings & Spencer, Ltd., Welland.

Pneumatic Tools.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Independent Pneumatic Tool Co., Chicago, New York.

Polishing Machines, Electric and Band.
Can. H. W. Johns-Manville Co., Toronto.

Portable Vise Stands.
New Britain Machine Co., New Britain, Conn.

Portable Steel Tool Racks.
New Britain Machine Co., New Britain, Conn.

Portable Steel Work Stands.
New Britain Machine Co., New Britain, Conn.

Power Plant Equipments.
Can. Fairbanks-Morse Co., Montreal.

Power Transmission.
Mesta Machine Co., Pittsburg, Pa.
The Smart Turner Mach. Co., Hamilton.

Press Screw (Adjustable).
W. F. & John Barnes Co., Rockford.
Wm. R. Perrin, Ltd., Toronto.

Presses, Bench Straightening.
Toledo Machine & Tool Co., Toledo.

Presses for Shells.
Can. Boomer & Boschert Press Co., Montreal.
Can. Locomotive Co., Kingston, Ont.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
Charles F. Elmes Eng. Works Chicago
Foss & Hill Machy. Co., Montreal.
Goldie & McCulloch Co., Galt, Ont.
Mesta Machine Co., Pittsburgh.
William R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Watson-Stillman Co., Aldene, N.J.
West Tire Setter Co., Rochester, N.Y.

Presses, Cam, Toggle, Eyelet.
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo, O.

Presses, Broaching.
E. W. Bliss Co., Brooklyn, N.Y.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman & Co., Aldene, N.J.

Presses, Drop.
W. H. Banfield & Son, Toronto.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Boomer & Boschert Press Co., Montreal.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Filter.
Lymburner, Ltd., Montreal.
Wm. R. Perrin, Ltd., Toronto.

Presses, Forging.
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
Charles F. Elmes Eng. Works, Chicago, Ill.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Wm. R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Co., Youngstown, O.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Company, Youngstown, O.
Toledo Machine & Tool Co., Toledo.
Watson Stillman Co., Aldene, N.J.

Presses, Pneumatic.
Toledo Machine & Tool Co., Toledo.

Presses, Power.
Baird Machine Co., Bridgeport, Conn.
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Geo. Gorton Machine Co., Racine.
Girard Machine & Tool Co., Philadelphia, Pa.
William R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.
A. R. Williams Machy. Co., Toronto.

Presses, Scrap Baling.
Can. Boomer & Boschert Press Co., Montreal.
William R. Perrin, Ltd., Toronto.
Watson-Stillman Co., Aldene, N.J.

Presses, Spring Foot.
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo.
Brown, Boggs & Co., Hamilton, Can.

Presses, Screw.
Can. Boomer & Boschert Press Co., Montreal
Wm. R. Perrin, Ltd., Toronto.

Pressure Regulators.
Can. Fairbanks-Morse Co., Montreal.

Protective Paint.
Jos. Dixon Crucible Co., Jersey City.

Pulleys.
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
D. K. McLaren, Ltd., Montreal.
Positive Clutch & Pulley Works, Ltd., Toronto.
The Smart-Turner Mach. Co., Hamilton.

Pulley Machinery, Drilling and Tapping.
Can. Fairbanks-Morse Co. Montreal.
Niles-Bement-Pond Co., New York.

Pumps, Air.
Mesta Machine Co., Pittsburg, Pa.

Pumps, High Pressure.
Charles F. Elmes Eng. Works Chicago
William R. Perrin, Ltd., Toronto
Southwark Foundry & Machine Co., Philadelphia.
Watson Stillman Co., Aldene, N.J.

Pumping Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Darling Brothers, Montreal.
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
National Mach. & Sup. Co., Hamilton.
Wm. R. Perrin Co., Toronto.
The Smart-Turner Mach. Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Company, Youngstown, O.

Pumps, all Kinds.
Can. Buffalo Forge Co., Montreal.
Charles F. Elmes Eng. Works, Chicago
Darling Brothers, Montreal.
Owen Sound Iron Works Co., Owen Sound.
William R. Perrin, Ltd., Toronto.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Watson-Stillman Co., Aldene, N.J.

Pumps, Electrically Driven.
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
The Smart-Turner Mach. Co., Hamilton.

Pumps, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Darling Brothers, Montreal.
Wm. R. Perrin Co., Toronto.
Southwark Foundry & Machine Co., Philadelphia.
Wm. R. Perrin, Ltd., Toronto.
Wm. Tod Co., Youngstown, O.
Watson-Stillman Co., Aldene, N.J.

Pumps for Oiling Systems.
S. F. Bowser & Co., Fort Wayne, Ind.

Pumps, Steam.
Darling Brothers, Montreal.
Wm. Tod Company, Youngstown, O.

Pump Leathers.
Graton & Knight Mfg. Co., Montreal.
Southwark Foundry & Machine Co., Philadelphia.

Punches and Dies.
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Scott Bros., Halifax, Eng.
Gardner, Robt., & Son, Montreal.
Globe Machine & Stamping Co.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

Punches, Power.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Watson-Stillman Co., Aldene, N.J.

Punches, Pneumatic.
Jno. F. Allen Co., New York.

Punching Machines, Horizontal.
Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Long & Alstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.

Pyrometers.
Canadian Hoskins, Limited, Walkerville, Ont.
Shore Instrument & Mfg. Co., New York City.
Thwing Instrument Co., Philadelphia, Pa.

Quartering Machines.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

Ratchet Wrenches.
Wells Brothers Co., Greenfield, Mass.

Railing, Iron and Brass.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada

Rail Benders.
Niles-Bement-Pond Co., New York.

Railroad Tools.
Can. Fairbanks-Morse Co., Montreal
Niles-Bement-Pond Co., New York.

Railroad Tools, Hydraulic.
Watson Stillman Co., Aldene, N.J

Rapping Plates.
Stevens, F. B., Detroit, Mich.

Ratchets.
Keystone Mfg. Co., Buffalo, N Y

Raw Hide Pinions.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Smart-Turner Machine Co., Hamilton, Ont.

Reamers, Adjustable.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co., Greenfield, Mass.

Reamers, Bridge, Expanding and High Speed.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.

Reamer Fluting Machines.
Garvin Machine Co., New York.

Reamers, Pipe, Cylinder and Locomotive.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reaming Machines, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.

Reamers, Steel Taper and Self-Feeding.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Rebuilt Machine Tools.
New York Machy. Co., New York.

Reels.
Baird Machine Co., Bridgeport, Conn.

Rheostats.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Rivet Machines.
Buffalo Forge Co., Buffalo, N.Y.
National Machinery Co., Tiffin, O.

Rivets, Tubular, Bifurcated.
Parmenter & Bulloch Co., Gananoque.

Rivets, Iron, Copper and Brass.
Parmenter & Bulloch Co., Gananoque.

Riveters, Pneumatic, Hydraulic, Hammer, Compression.
Jno. F. Allen Co., New York.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co. of Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
National Mach. & Sup. Co., Hamilton
Niles-Bement-Pond Co., New York.
Watson-Stillman Co., Aldene, N.J.

Riveting Machines, Elastic Rotary Blow.
Girard Machine & Tool Co., Philadelphia, Pa.
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.
Southwark Foundry & Machine Co., Philadelphia.

Rolls, Bending.
John Bertram & Sons Co., Dundas, Ont.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.

Rolling Mill Machinery.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Co., Youngstown O.

Roofing.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Rotary Converters.
A. R. Williams Machy. Co., Toronto.
Toronto and Hamilton Electric Co., Hamilton.

Rubber Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Rules.
Brown & Sharpe Mfg. Co., Providence, R.I.
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

Safety Set Screws.
Allen Mfg. Co., Inc., Hartford, Conn.

Sand Blasts.
Curtis Pneumatic Machinery Co., St. Louis, Mo.

Saw Blades.
Diamond Saw & Stamping Works, Buffalo, N.Y.

Saw Tables.
Hub Machine Welding & Contracting Co., Philadelphia, Pa.

Saw Sharpening Machines.
Nutter & Barnes Co., Hinsdale, N.H.

Saw Mill Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt. & Son, Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
National Mach. & Sup. Co., Hamilton.
Plessisville Foundry, Plessisville, Que.

Saws, High-Speed, Friction.
Hunter Saw & Machine Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Nutter & Barnes Co., Hinsdale, N.H.

Saws, Inserted Tooth.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hack.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo.
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
L. S. Starrett Co., Athol, Mass.

Saws, Circular Metal.
Hub Machine Welding & Contracting Co., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburg, Pa.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hot and Cold.
Hunter Saw & Machine Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburgh.
Nutter & Barnes Co., Hinsdale, N.H.

Scleroscopes.
Shore Instrument & Mfg. Co., New York City.

Screw Machine Products.
Wallace, Barnes Co., Bristol, Conn.

Screw Machines, Hand, Automatic.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
A. B. Jardine & Co., Hespeler.
Moteh & Merryweather Machy. Co., Cleveland, O.
National Mach. & Sup. Co., Hamilton.
New Britain Machine Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Windsor Machine Co., Windsor, Vt.

Screw Machines, Multiple Spindle.
New Britain Machine Co., New Britain, Conn.
Windsor Machine Co., Windsor, Vt.

Screw Plates.
Butterfield & Co., Rock Island, Que.
Can. Tap & Die Co., Galt, Ont.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Wells Brothers Co., Greenfield, Mass.
Wiley & Russell Co., Greenfield, Mass.

Screw Slotters.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Set Screws, Safety.
Allen Mfg. Co., Hartford, Conn.

Second-Hand Machinery.
New York Machinery Co., New York.
Gardner, Robt. & Son, Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Gardner, Robt. & Son, Montreal.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.
Union Drawn Steel Co., Hamilton.

Shanks, Straight and Taper.
Jacobs Mfg. Co., Hartford, Conn.

Shapers.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canada Machy. Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Hendey Machine Co., Torrington, Ct.
Hill, Clarke & Co., of Chicago, Chicago, Ill.

Shafting.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Sharpening Stones.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

Shavings, Separators.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Shearing Machines, Angle Iron, Bar and Gate.
John Bertram & Sons Co., Dundas.
Bertrams, Ltd., Edinburgh, Scotland.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler.
Long & Alstatter, Hamilton, Ohio.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, Eng.
Toledo Machine & Tool Co., Toledo.

Shears, Power.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown Boggs Co., Ltd., Hamilton, Canada.
Buffalo Forge Co., Buffalo, N.Y.
Girard Machine & Tool Co., Philadelphia, Pa.
Mesta Machine Co., Pittsburg, Pa.
National Machy. Co., Tiffin, Ohio.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, Eng.
Toledo Machine & Tool Co., Toledo.

Shears, Lever, Hydraulic.
Mesta Machine Co., Pittsburg, Pa.
Watson-Stillman Co., Aldene, N.J.

Shears, Pneumatic.
John F. Allen Co., New York.
Toledo Machine & Tool Co., Toledo, Ohio.

Shears, Squaring.
Brown, Boggs, & Co., Hamilton, Can.

Sheet Metal Working Tools.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Works, Ltd., Chatham, Ont

Sheet Metal Stampings.
Duncan Electrical Co., Montreal.

Shell Banding Machines, Hydraulic.
Wm. Cramp & Sons Ship & Engine Bldg. Co., Philadelphia, Pa.
Can. Locomotive Co., Kingston, Ont.
Goldie & McCulloch Co., Galt, Ont.
Lymburner, Ltd., Montreal.
Moteh & Merryweather Machy. Co., Cleveland, O.
Watson-Stillman Co., Aldene, N.J.
West Tire Setter Co., Rochester, N.Y.

Shell Lathes.
Garlock-Machinery, Toronto.
Jenckes Machine Co., Sherbrooke, Que.
Kellogg & Co., Toronto.

Shell Manufacturing Tools.
Amalgamated Machinery Corporation, Chicago, Ill.
Frank Toomey, Inc., Philadelphia, Pa.
Garlock-Machinery, Toronto.
New York Machinery Exchange, New York.
Hill, Clarke & Co. of Chicago.

Shell Painting Machine.
Can. Buffalo Forge Co., Montreal.
Can. Locomotive Co., Kingston, Ont.

Shell Screws, Headless.
Blake & Johnson, Waterbury, Conn.

Shell Riveters.
Grant Mfg. & Machine Co., Bridgeport, Conn.

Shelving, Steel Partitions.
Canadian Steel Products Company, Montreal.

Shrapnel Shell Marker.
Brown-Boggs Co., Hamilton, Ont.
Holden-Morgan Co., Toronto.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Shrapnel Sand Blasts.
W. W. Sly Mfg. Co., Cleveland, O.

Side Tools.
Armstrong Bros. Tool Co., Chicago.

Sirens, Electric.
Lintz-Porter Co., Toronto.

Silver Solder.
Geo. H. Lees & Co., Ltd., Hamilton, Ont.

Slotters.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.

Smokestacks.
Plessisville Foundry, Plessisville, Que.

Sockets.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Soldering Irons.
Brown, Boggs & Co., Hamilton, Can.

Solders.
Tallman Brass & Metal Co., Hamilton.

Specialties, Electric.
Lintz-Porter Co., Toronto.

Special Machinery.
Armstrong Bros., Toronto.
W. H. Banfield & Sons, Toronto.
John Bertram & Sons Co., Dundas.
Baird Machine Co., Bridgeport, Conn
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Canada Machy. Agency, Montreal.
Cunningham & Sons, St. Catharines, Ont.
Charles F. Elmes Eng. Works, Chicago
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
Jardine, A. B., & Co., Hespeler.
National Electric Welder Co., Warren, Ohio.
National Forge & Tool Co., Erie, Pa.
National Mach. & Sup. Co., Hamilton.
Plessisville Foundry, Plessisville, Que.
Smart-Turner Machine Co., Hamilton, Ont.
William R. Perrin, Ltd., Toronto.
Wm. Tod Company, Youngstown, O.

Spike Machines.
The Smart-Turner Machine Co., Hamilton.

Spring Coilers.
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

Springs, Machinery.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.
Wallace, Barnes Co., Bristol, Conn.

Spring Making Machinery (Automatic).
Baird Machine Co., Bridgeport, Conn.

Sprockets, Chain.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

Stairs, Iron.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Stamping.
Duncan Electrical Co., Montreal.

Stamping Machinery.
Brown, Boggs & Co., Hamilton, Can.

Stationary Ladders.
New Britain Machine Co., New Britain, Conn.

Steam Specialties.
Sheldons, Ltd., Galt, Ont.

Steam Separators and Traps.
Can. Fairbanks-Morse Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

Steel Alloy.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel Chains for Pulp Mill and Saw Mill.
Plessisville Foundry, Plessisville, Que.

Steel Bench Legs.
New Britain Machine Co., New Britain, Conn.

Steel Bending Brakes.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Steel, Cold Rolled.
Can. Drawn Steel Co., Hamilton, Ont.
A. C. Leslie & Co., Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.
Wallace, Barnes Co., Bristol, Conn.

Steel Pressure Blowers.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Steel, all kinds.
Lackawanna Steel Co., Lackawanna, N.Y.

Steel, High Speed.
Armstrong Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Ltd., Montreal.
Thos. Firth & Sons, Montreal.
Hawkridge Bros. Co., Boston, Mass.
National Mach. & Sup. Co., Hamilton.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel Die Engraving.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Steel Machinery.
Hawkridge Bros. Co., Boston, Mass.

Steel Vanadium.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Stock Racks for Bars, Piping, Etc.
New Britain Machine Co., New Britain, Conn.

Stocks for Dies.
Wells Bros. Co., Greenfield, Mass.

Stocks, Pipe.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corporation, Greenfield, Mass.

Stools, Steel, Shop.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Storage Systems.
S. F. Bowser & Co., Fort Wayne, Ind.

Stoves, Electric.
Lintz-Porter Co., Toronto.

Straight Edges.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Straightening Machinery.
Baird Machine Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland
National Mach. & Sup. Co., Hamilton.

Structural Steel.
Hamilton Bridge Works Co., Hamilton, Ont.
Lackawanna Steel Co., Lackawanna, N.Y.
Owen Sound Iron Works Co., Owen Sound, Ont.

Stud Driver.
Keystone Mfg. Co., Buffalo, N.Y.

Switchboards and Telephones.
Lintz-Porter Co., Toronto.
Toronto & Hamilton Electric Co., Hamilton.

Switches, Railway.
National Mach. & Sup. Co., Hamilton.

Tanks, Oil, Etc.
S. F. Bowser & Co., Fort Wayne, Ind.

Tanks, Steel.
John Inglis Co., Toronto.
Plessisville Foundry, Plessisville, Que.
Toronto Iron Works, Ltd., Toronto.

Tanks, Pressure.
Toronto Iron Works, Ltd., Toronto.

Tank Wagons.
Toronto Iron Works, Ltd., Toronto.

Tapes, Measuring.
James Chesterman & Co., Ltd., Sheffield, Eng.

Tapes, Friction.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Tapping Machines (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

Tapping Machines and Attachments.
Baker Brothers, Toledo, O.
John Bertram & Sons Co., Dundas.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
Girard Machine & Tool Co., Philadelphia, Pa.
Greenfield Tap & Die Corporation, Greenfield, Mass.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit
Niles-Bement-Pond Co., New York.
Rickart Shaper Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.

Tap Chucks.
Wells Bros., Greenfield, Mass.

Taps, Adjustable.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.

Taps, Dies and Wrenches.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Can. Tap & Die Co., Galt, Ont.
Cleveland Twist Drill Co., Cleveland.
Geometric Tool Co., New Haven, Conn.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Brothers Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Technical Books.
The MacLean Publishing Co., Ltd., Toronto.

Telephone Systems.
Lintz-Porter Co., Toronto.

Testing Instruments, Metallurgical.
Shore Instrument & Mfg. Co., New York City.

Testing Laboratories.
Toronto Testing Laboratory, Toronto.

Thread Cutting Machines.
Can. Fairbanks-Morse Co., Montreal.
Garvin Machine Co., New York.
Geometric Tool Co., New Haven, Conn.
Girard Machine & Tool Co., Philadelphia, Pa.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
National Machy. Co., Tiffin, Ohio.

Time Clocks.
International Time Recording Co Toronto.
Lintz-Porter Co., Toronto.

Tinsmiths' Tools.
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Tire Setting Machines, Hydraulic.
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

Tire, Wheels.
Wells Bros. Co., Greenfield, Mass.

Toolmakers' Files.
American Swiss File & Tool Co., New York.

Tool Boxes, Steel.
Can. Steel Products Co., Montreal.

Tool Holders.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Tool Room Partitions.
Can. Wire & Iron Goods Co., Hamilton.

Tool Posts, Lathe.
Armstrong Bros. Tool Co., Chicago.

Tool Steel.
Armstrong, Whitworth, Ltd., of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Thos. Firth & Sons, Montreal.
Hawkridge Bros. Co., Boston, Mass.
A. C. Leslie & Co., Ltd., Montreal.
National Mach. & Sup. Co., Hamilton.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Tools, Blacksmiths', Etc.
A. R. Williams Machy. Co., Toronto.

Tools, Electrical.
A. R. Williams Machy. Co., Toronto.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
United States Elec. Tool Co., Cincinnati, O.

Tools, Lathe, Planer and Slotter.
Armstrong Bros. Tool Co., Chicago.

Torches, Steel.
Stevens, F. B., Detroit, Mich.
Armstrong, Whitworth of Canada, Ltd., Montreal.

Track Bits.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Track Systems.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Track Tools.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Can. Fairbanks-Morse Co., Montreal.

Transformers and Converters.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Transmission Machinery.
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Mach. Co., Toronto.
Jones & Glassco, Montreal.
Main Belting Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
Plessisville Foundry, Plessisville, Que.
F. Reddaway & Co., Montreal.
The Smart-Turner Machine Co., Hamilton.

Transmission Towers.
Can. Bridge Co., Walkerville, Ont.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

Traveling Cranes.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Trolley Hoists, Electric.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Trucks, Lumber and Kiln.
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

Trucks, Factory, Freight, Etc.
Chambers, Ltd., Toronto.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

Tube Expanders (Rollers).
A. B. Jardine & Co., Hespeler.
Watson-Stillman Co., Aldene, N.J.

Tumbling Barrels.
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Turbines, Steam.
Southwark Foundry & Machine Co., Philadelphia, Pa.

Turnbuckles.
Canadian Billings & Spencer, Ltd., Welland.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Turret Machines.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fay & Scott, Dexter, Me.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
New Britain Machine Co., New Britain, Conn.
Pratt & Whitney, Hartford, Conn.
Turner Machine Co., Ltd., Danbury, Conn.
Warner & Swasey, Cleveland, O.

Turbines, Steam, Water.
Plessisville Foundry, Plessisville, Que.

Upsetting and Bending Machinery.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler.
National Machy. Co., Tiffin, O.
Niles-Bement-Pond Co., New York.
Watson-Stillman Co., Aldene, N.J.

Vacuum Pumps.
Buffalo Forge Co., Buffalo, N.Y.
Mesta Machine Co., Pittsburgh.
Smart-Turner Machine Co., Hamilton, Ont.

Valve Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Valves, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Watson-Stillman Co., Aldene, N.J.
R. D. Wood & Co., Philadelphia, Pa.

Valve Leathers.
Graton & Knight Mfg. Co., Montreal.

Valves, Back Pressure, Steam.
Mesta Machine Co., Pittsburg, Pa.
Sheldons, Limited, Galt.

Vanadium Steel.
H. A. Drury Co., Ltd., Montreal.
Hawkridge Bros. Co., Boston, Mass.

Ventilating Apparatus.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Limited, Galt.
A. R. Williams Machy. Co., Toronto.

Vises, Bench.
Emmert Mfg. Co., Waynesboro, Pa.
Hollands Mfg. Co., Erie, Pa.
National Mach. & Sup. Co., Hamilton.
New Britain Machine Co., New Britain, Conn.

Vises, Pipe.
Armstrong Mfg. Company, Bridgeport, Conn.
Bignall & Keeler Mach. Works, Edwardsville, Ill.
Butterfield & Co., Rock Island, Que.
Emmert Mfg. Co., Waynesboro, Pa.
National Mach. & Sup. Co., Hamilton.
J. H. Williams Co., Brooklyn, N.Y.

Vises, Planer and Shaper.
Girard Machine & Tool Co., Philadelphia, Pa.
National Mach. & Sup. Co., Hamilton.
Skinner Chuck Co., New Britain, C.

Vises, Milling Machine.
National Mach. & Sup. Co., Hamilton.

Vises, Woodworking.
Emmert Mfg. Co., Waynesboro, Pa.

Washers.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Wallace, Barnes Co., Bristol, Conn.

Washer Machines.
National Machy. Co., Tiffin, Ohio.

Waterproof Coating, Cement, Fabric.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Watchman's Clocks.
Lintz-Porter Co., Toronto.
A. R. Williams Machy. Co., Toronto.

Water Towers.
Toronto Iron Works, Ltd., Toronto.

Welding and Cutting Clamps.
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
L'Air Liquide Society, Toronto.
Lever Bros., Toronto.
National Electric Welder Co., Cincinnati, O.

Welding and Cutting Work.
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
L'Air Liquide Society, Toronto.
Lever Bros., Toronto.
Metals Welding Co., Cleveland, O
National Electric Welder Co., Cincinnati, O.

Welding, Autogenous.
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
L'Air Liquide Society, Toronto.
Lever Bros., Toronto.
National Electric Welder Co., Cincinnati, O.

Welding, Acetylene and Oxygen.
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
L'Air Liquide Society, Toronto.
Lever Bros., Toronto.
Metals Welding Co., Cleveland, O.
National Electric Welder Co., Cincinnati, O.

Welding Machines, Electric, etc
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
Lever Bros., Toronto.
National Electric Welder Co., Cincinnati, O.
Tabor Mfg. Co., Philadelphia, Pa.

Wheels, Emery, Carborundum.
Can. Hart Wheels, Ltd., Hamilton, Ont.

Wheels, Belt, Fly, Gear and Rope.
Mesta Machine Co., Pittsburg, Pa.

Winches.
John H. Hall & Sons, Brantford.
Northern Crane Works, Walkerville.

Window Wire Guards.
Canada Wire & Iron Goods Co., Hamilton.

Wire Cloth and Perforated Metals.
Canada Wire & Iron Goods Co., Hamilton.
Dennis Wire & Iron Works Co., Ltd., London.

Wire Forms.
Wallace, Barnes Co., Bristol, Conn.

Wire Forming and Stamping Machinery.
Brown, Boggs Co., Ltd., Hamilton Canada.
F. B. Shuster Co., New Haven, Conn.
Baird Machine Co., Bridgeport, Conn.

Wire Guards and Railings.
Canada Wire & Iron Goods Co., Hamilton, Ont.

Wire Nails.
Parmenter & Bulloch Co., Gananoque.

Wire Nail Machinery.
National Machy. Co., Tiffin, Ohio.
A. R. Williams Machy. Co., Toronto.

Wire, Spring.
Wallace, Barnes Co., Bristol, Conn.

Wire Straighteners and Cutters.
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.

Wire Coiling and Pointing Machines.
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.

Wood Boring Machines.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Machinery, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.

Woodworking Machinery.
Buffalo Forge Co., Buffalo, N.Y.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Machinery, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
New Britain Machine Co., New Britain, Conn.
Plessisville Foundry, Plessisville, Que.
A. R. Williams Machy. Co., Toronto.

Wrenches, Compression.
Lutz-Webster Engineering Co., Inc., Philadelphia, Pa.

Wrenches.
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Lutz-Webster Engineering Co., Inc., Philadelphia, Pa.
Wells Bros. Co., Greenfield, Mass.
J. H. Williams Co., Brooklyn, N.Y.

Wrenches, Automobile Narrow Jaw and Monkey.
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Trimont Mfg. Co., Roxbury, Mass.

Wrenches, Pipe, Monkey.
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Trimont Mfg. Co., Roxbury, Mass.

Wrenches, Ratchet and Basin.
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Trimont Mfg. Co., Roxbury, Mass.

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